SUGARCANE RESEARCH

Annual Progress Report

1984

LOUISIANA
AGRICULTURAL
EXPERIMENT STATION
LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER

SUGARCANE RESEARCH

ANNUAL PROGRESS REPORT

1984

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LOUISIANA AGRICULTURAL EXPERIMENT STATION
DR. DOYLE CHAMBERS, VICE CHANCELLOR OF RESEARCH AND DIRECTOR

LOUISIANA STATE UNIVERSITY AGRICULTURAL CENTER
DR. H. ROUSE CAFFEY, CHANCELLOR

FOREWORD

Research on sugarcane in the Louisiana Agricultural Experiment Station is an integral part of the LSU Agricultural Center's research-extension effort to provide the base knowledge and technology for efficient production and processing of sugarcane. Funds are expended through discipline oriented departments and regionally oriented branch stations.

Scientists working on sugarcane are housed in six departments: Agricultural Economics and Agribusiness, Agricultural Engineering, Agronomy, Entomology, Plant Pathology and Crop Physiology, and the Sugar Station. Most faculty members of the Louisiana Agricultural Experiment Station hold joint appointments with the College of Agriculture, teach at the undergraduate and/or graduate level, and are involved in graduate student training.

Members of the Louisiana Agricultural Experiment Station maintain close working relations with colleagues employed by the Agricultural Research Service of the USDA, American Sugar Cane League, Audubon Sugar Institute and other budgetary units of the Baton Rouge Campus, and the Louisiana Cooperative Extension Service, Louisiana Department of Agriculture, and Soil Conservation Service of the USDA.

A major portion of the St. Gabriel Research Station's resources is devoted to sugarcane research. The participation of the Burden Research Plantation, Citrus Research Station, Hammond Research Station, and Idlewild Research Station in helping to accomplish specific sugarcane research objectives in 1984 is acknowledged.

An important part of the 1984 research activities was conducted on cooperating farms throughout the sugarcane industry. The dwindling of farm labor supply has been making the evaluation of location effects increasingly difficult. However, these evaluations are very important and must be continued. The cooperation of the membership of the American Sugar Cane League in accomplishing this research is gratefully acknowledged.

Finally it must be pointed out that the information in this report is from 1984 only and should be regarded as preliminary. Completed research is reported in appropriate Experiment Station and Extension Service publications and/or other professional publications.

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SUGARCANE FIELD DAY REPORT - 1984

Charles G. Richardson
St. Gabriel Research Station

The St. Gabriel Research Station is one of seventeen branch stations in the Louisiana Agricultural Experiment Station. This property was obtained from the Louisiana Department of Corrections in 1968. The Station is made up of 1,464 acres located approximately 10 miles from the campus. The research is directed by the various departments on the campus. There are twenty Project Leaders representing seven different departments with research projects on the station at the present time. This research includes Animal Science, Entomology and Sugarcane.

In 1982 the Sugarcane Researchers on the station and interested County Agents in the area met to establish the LSU Area Sugarcane Field Day to be held on the St. Gabriel Research Station annually.

The Second Annual LSU Area Sugarcane Field Day was held on the St. Gabriel Research Station July 18, 1984. This field day is a cooperative effort of the Louisiana Agricultural Experiment Station and the Louisiana cooperative Extension Service.

The Sugarcane Research Project Leaders conducted a field tour of the Sugarcane research on the station and discussed such topics as: Borer Count Demonstration, Wide Furrow Planting, Sugarcane Diseases and Heat Treatment, Sugarcane Varieties, Weed Control and Improving Commerically Recoverable Sugar.

During the assembly following the field tour, Dr. H. Rouse Caffey, Chancellor of LSU Agriucltural Center was the Guest Speaker. The County Agents from the participating parishes presented the High Yield Awards for their respective parishes at this time.

The participating parishes included: Iberville, Pointe Coupe, St. John, St. James and West Baton Rouge.

West Baton Rouge Parish served as Host Parish for this year. They prepared and served a very enjoyable meal for approximately 270 guests.

Sugarcane Weed Control Annual Report 1984

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During the year 1984, several projects were initiated or completed in the area of sugarcane weed control. The major areas researched included: (1) Tolerance of sugarcane to new experimental herbicides, (2) Feasibility of layby application of herbicides in sugarcane, (3) Use of Asulox and Dowpon combinations for control of johnsongrass and itchgrass in sugarcane, (4) Effect of 2,4-D on the emergence and yield of seedcane, (5) Use of Roundup in a sugarcane fallow johnsongrass control program, (6) Ecology and growth of johnsongrass in sugarcane, (7) Herbicide efficacy tests in sugarcane, (8). Use of soybean oil as a surfactant with Asulox, and (9) Use of Oust and Roundup tankmixes for ditchbank weed control. A brief summary of each of these topics follows.

Tolerance of Sugarcane to New Herbicides:

Several new herbicides were tested for sugarcane tolerance in 1984. Racer, a herbicide being developed by Stauffer Chemical Company, caused initial injury to sugarcane in the form of chlorosis and a slight reduction in height and stem number. However, by final harvest, no effects on yield components of sugarcane were detected.

Scepter and Arsenal are two herbicides currently being developed by American Cyanamid. Scepter is being tested for broadleaf and annual grass control in soybeans. In sugarcane, Scepter showed some initial injury to the sugarcane, but significant effects on yield were observed at rates less than 0.75 lb/A. At 0.75 lb/A, a decrease in mean stalk weight of sugarcane was observed. Arsenal is being developed for broadspectrum weed control on ditchbanks and rights-of-way. When applied at 0.125 to 0.50 lb/A, Arsenal caused 19 to 35% injury to the sugarcane as evaluated 37 days after treatment (DAT). Stem number and height were both decreased by rates greater than 0.125 lb/A. Mean stalk weight was reduced by the 0.50 lb/A rate. In general, yields appear to be reduced by this compound, thus, the herbicide does not appear to be safe for use in sugarcane.

ACP-1900 was another compound tested for sugarcane tolerance. The compound caused initial injury to sugarcane. When applied at 0.125 lb/A, mean stalk weight was reduced causing yields to be less than that of the untreated plots. Use of this compound in sugarcane is somewhat questionable.

Zorial is a herbicide produced by Zoecon, Inc. and is currently labelled for control of broadleaf weeds and annual grasses in cotton. At 37 DAT, only slight injury to the sugarcane was observed. Final results indicated that Zorial is safe for use in sugarcane when applied at rates from 0.5 to 1.5 lb/A.

In the 1984 tests, Sinbar at 1.0 lb/A was slightly less injurious to sugarcane than Sencor/Lexone applied at 2.0 lb/A. Slightly higher yields were observed where Sinbar was applied. These higher yields appeared to be a result of higher mean stalk weight and stem number where Sinbar was applied. This is not consistent across years, in that some years Sencor/Lexone appears less injurious to sugarcane and some years Sinbar appears less injurious to sugarcane. This further illustrates the fact that, in general, tolerance of sugarcane to these two compounds is about the same on a Commerce Silt Loam.

Feasibility of Layby Application of Herbicide for Weed Control in Sugarcane:

Past research indicated that in the standard 3 year cycle for sugarcane, layby application of herbicides will result in excellent weed control but not improvement in yields. Thus, in 1984, research was initiated to investigate the potential use of layby herbicide applications to increase the stubbling years of sugarcane. Two sites were selected, one in St. Mary Parish, and one in Assumption Parish. Application of atrazine or Evik at layby resulted in excellent weed control at both locations. In St. Mary Parish, yields were significantly increased by use of the layby treatment. This was due to the fact that the area was heavily infested with scarlet morningglory which caused decreased sugarcane stem numbers and a higher incidence of lodging. In 1985, research will be continued at these sites and will be initiated at two additional sites. All areas will be monitored for weed control, yields, sugarcane borer damage, disease, and nematodes for a 6 year sugarcane cycle to determine possible factors that may be limiting sugarcane stubbling ability.

Use of Asulox/Dowpon Tankmixes for Control of Itchgrass and Johnsongrass in Sugarcane:

Two years of data indicate that tankmix combinations of Asulox and Dowpon can provide excellent control of johnsongrass and itchgrass. Tankmixing 2.00 lb/A Asulox with 3.00 lb/A Dowpon provided excellent control of both of these troublesome weeds. Johnsongrass control was greater than that observed for recommended rates of Dowpon and equilvale to control by recommended rates of Asulox. In addition, itchgrass control was superior to either of the compounds applied alone at recommended rates. When applied to a 36 in. band, this tankmix resulted in a substantial savings to the grower. Large plot tests will be conducted in 1985 to further refine rates for these tankmixes.

Effect of 2,4-D on Seedcane Germination and Yields:

A study was initated in the fall of 1983 to determine if 2,4-D applied at 2.00 lb/A to seedcane would cause reduction in the germination and subsequent yield of the plant cane produced from the seedcane. Nine different varieties were tested. Generally across all varieties, the number of stems emerging per cane planted was significantly reduced by 2,4-D applications. In addition, yields were reduced across all varieties. This research indicates that growers should use a layby application of atrazine to control broadleaf weeds in seedcane to prevent use of 2,4-D. The study is being repeated in 1985 and the effect of 2,4-D on the stubbling ability of sugarcane is also being investigated.

Use of Roundup in a Sugarcane Fallow Johnsongrass Control Program:

Recently, more attention is being paid to the use of Roundup as a johnsongrass control tool in sugarcane fallow fields, especially where mechanical tillage was not feasible. In 1984, a study was initiated to determine the feasibility of utilizing Roundup in a fallow system. The tests were conducted in 4 locations across south Louisiana. Roundup was applied at 1.00 lb/A plus 0.50% X-77 in 9 gal/A spray solution. Treatments included (1) standard mechanical fallow, (2) Roundup applied early followed by mechanical tillage, (3) mechanical tillage followed by a late application of Roundup (1 to 3 wks prior to planting), and (4) minimal tillage with Roundup

applied both early and late. Sites included two areas where sugarcane was not busted out and two sites where the sugarcane was busted out. Data will be collected in 1985 to determine johnsongrass infestation levels and subsequent yields of plant cane following the various treatments. The studies will be repeated in 1985.

Ecology and Growth of Johnsongrass in Sugarcane:

The growth of seedling johnsongrass in sugarcane as affected by emergence date of the weed has been monitored for the last 3 years in plant cane or first stubble sugarcane. Data is being analyzed to determine if certain, easily measured characteristics of the sugarcane at the time of johnsongrass emergence may predict the potential competitive ability of the johnsongrass at the end of the season. This study will assist the grower in determining if johnsongrass should be treated with herbicide when it is observed or if the johnsongrass may be left untreated due to the fact that it will not produce a plant large enough to compete with the sugarcane or produce a rhizome. Data analysis should be complete in 1985.

Herbicide Efficacy Tests in Sugarcane:

2,4-D applied alone at 0.5 to 1.5 lb/A provided 50 - 60% control of goldenrod. Tankmixing 0.5 lb/A 2,4-D with Brominal at 0.25 lb/A provided goldenrod control equivalent to 2,4-D applied at 1.5 lb/A. None of the treatments resulted in adequate control of the weed.

In the johnsongrass control in sugarcane test, Racer, Scepter, Prowl plus Asulox, Prowl plus Atrazine plus Asulox, and Asulox alone were tested. The only treatments providing excellent control of johnsongrass were those containing Asulox. When atrazine was tankmixed with Asulox and Prowl, johnsongrass control was significantly reduced, indicating that atrazine may be antagonistic to Asulox.

Several new herbicides were tested for control of goldenrod in sugarcane including Racer, Scepter, AFX-1280, AFX-1281, and Sencor/Lexone. None of the treatments provided adequate control of the weed. However, Racer, AFX-1280, and AFX-1281 were the better treatments observed.

Use of Soybean Oil as a Surfactant with Aerially Applied Asulox:

In 1984, a test was conducted to determine the effect of soybean oil on the efficacy of aerially applied Asulox. Soybean oil (8.3%), Agridex (1.0%), and X-77 (0.25%) did not cause significant injury to the sugarcane (variety CP 72-370). In addition, no significant differences in johnsongrass control were observed with the surfactants. Ground applications of Asulox indicated the same results. In general, any of these surfactants may be used for control of johnsongrass in sugarcane and result in similar weed control levels.

Use of Oust and Roundup Tankmixes for Ditchbank Weed Control:

Studies were conducted in three sites in south Louisiana to determine the best rates for tankmixing Oust with Roundup. The tankmixes with these two herbicides provides weed control superior to that of the herbicides applied alone. Synergism between the herbicides is suggested. The best treatment using the lowest possible rates of the two herbicides was Oust at 0.063 to 0.125 lb/A plus Roundup at 1.5 pints/A.

Sugarcane Pathology Annual Report 1984

Jeff W. Hoy
Department of Plant Pathology and Crop Physiology

State-Wide Sugarcane Smut Survey:

Sixty-one randomly selected farms in the 15 sugarcane-growing Parishes were surveyed for smut during the 1984 growing season to determine the status of smut in Louisiana four years after the disease was first observed.

Smut-infected plants were observed in 13 of 15 Parishes, an increase of five since the initial surveys in 1981. Smut was not observed in Pointe Coupee or St. Charles Parish. The highest average level of smut infection (2.0%) was observed in CP 73-351 which was followed by NCo 310 (1.0%), CP 74-383 (0.7%) and CP 65-357 (0.4%). Smut was observed in 54% of the CP 73-351 fields surveyed, 80% of the NCo 310 fields, 39% of the CP 74-383 fields and 34% of the CP 65-357 fields. Smut was only observed in trace amounts in 2 of 107 (1.8%) fields of the resistant varieties, CP 70-321, CP 70-330, CP 72-356 and CP 72-370. The highest average level of sugarcane smut infection is currently found in the Teche area with smut occurring infrequently in the River and Bayou LaFourche Parishes. The 1984 survey results indicate that smut is spreading through the Louisiana sugarcane growing regions, but the severity of the disease is not increasing. It is apparent that certain factors are limiting smut disease development in Louisiana sugarcane fields, and investigations have been initiated to determine what these factors are and whether or not they will continue to limit the disease in the future.

Smut Associated Yield Loss Study:

Four commercial fields, three plant-cane and one stubble-cane, of CP 73-351 were located during the smut survey with naturally occurring levels of smut infection sufficient to allow a yield loss estimation experiment to be conducted.

The number of stalks showing a smut whip and smut-free stalks were counted in 25 single-row plots in each field, and a yield estimate was then determined for each plot at the end of the growing season.

A statistical analysis comparing the level of smut infection and estimated yield for each of the 25 plots indicated that smut had a significant negative effect on yield in each field. The results were similar in all four fields. As smut infection levels increased, yields decreased. At low levels of infection (less than 5%), yield losses are hard to detect, so the typical levels of smut infection now occurring in the industry probably do not cause appreciable yield losses. The yield loss study results suggest that varieties, such as CP 65-357, CP 74-383 and CP 76-331, which are rated as moderately susceptible in the smut inoculation trials, may be grown successfully in Louisiana. During 1984, a few commercial fields of CP 73-351 were observed with levels of

smut infection exceeding 20%, so highly susceptible varieties, such as CP 73-351, should probably not be grown in Louisiana.

Smut Overwintering Study:

Portions of two plant-cane fields of CP 65-357 and one plant-cane field of CP 74-383 with low levels of smut infection were mapped during the 1984 growing season. All smutted stools of cane were marked along with an equal number of healthy, smut-free stools. During the 1985 growing season, the fields will be monitored to determine whether or not smutted cane stools are more susceptible than smut-free stools to winter kill.

Smut Inoculation Trials:

Each year all varieties in the later stages of the sugarcane breeding program are artificially inoculated with smut to determine their level of resistance or susceptibility to smut infection. Tests are conducted by both LSU and the USDA Sugarcane Field Laboratory, and varieties determined to be highly susceptible to smut are eliminated from the selection program. In 1984, 14 varieties were dropped because of high susceptibility to smut.

This year, an unreplicated screen of large numbers of varieties at an earlier stage in the selection program was added to attempt to identify very susceptible varieties before considerable amounts of time, space and money are spent continuing to bring them through the program.

The LSU smut inoculation trials are now located at the Citrus Branch Experiment Station in Plaquemines Parish. This isolated location will allow for experiments to be conducted on varietal reactions to natural infection, the means of disease spread and the nature of resistance to smut.

Evaluation of Mosaic Resistance in Outfield Tests:

All LSU outfield test plots were surveyed to determine the level of mosaic infection in advanced varieties at each location. This information considered with data provided by the USDA Sugarcane Field Laboratory allows the identification of varieties susceptible to mosaic. During 1984, four varieties were eliminated from the variety selection program because of mosaic susceptibility.

Soilborne Pathogen Research:

A preliminary greenhouse test using raw sugarcane field soil and sterilized soil indicated that soilborne pathogens have a highly significant negative effect on root number and weight, top weight and tiller number in CP 70-321. Future tests will use selective pesticides to determine which components of the soil microflora cause the most damage and whether or not a correlation exists between root rot resistance and stubbling ability.

A replicated field test employing different pesticides active against Pythium, nematodes or other soilborne pathogens was planted to determine the single season and long term effects of soilborne pathogens on CP 70-321 and CP 70-330 and to determine the efficacy of these chemicals for the control of diseases caused by soilborne pathogens.

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DEPARTMENT OF PLANT PATHOLOGY AND

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PROJECT H 2196 DETECTION OF RATOON STUNTING DISEASE AND SUGARCANE MOSAIC VIRUS IN SUGARCANE

A technique, alkaline induced metaxylem autofluorescence, was developed to diagnose ratoon stunting disease (RSD). It involves using fluorescence microscopy to detect changes in the plant's vascular system cell walls caused by the ratoon stunt bacteria which live in the vascular system. Basal internodes of sugarcane stalks are cut into cross-sections about the size of a quarter and viewed under the microscope. Diseased canes show a red metaxylem wall autofluorescence which is lacking in healthy canes.

This technique has been shown to be superior to visual symptoms for detecting the disease. It was shown that CP 65-357 can be a symptomless carrier of ratoon stunting disease, i.e. no visible symptoms of red at the node when sliced longitudinally, but the stalks still have the disease as evidenced by the fluorescence test and the presence of the causal bacterium.

The technique has been used to obtain an estimate of the incidence of RSD in Louisiana. The results of a survey indicated that at least 23 of 46 fields of CP 65-357 or over half of the fields surveyed had RSD (Louisiana Agriculture 27(2)6-7 1983/84).

Last fall many but not all of the release plots of CP 76-331 were sampled for RSD in cooperation with the American Sugarcane League. The alkaline induced metaxylem autofluorescence assay was used to detect the

disease. The purpose of the sampling was to get an estimate of the importance or magnitude of this avenue for spreading the disease to the grower. This disease is known to spread in only two ways: first by planting diseased seed and second by the harvester going from diseased to healthy cane. The results (TABLE 1) indicate that RSD was detected in 9 of 26 plots. The small sample size does not provide good evidence for the absence of disease in the remaining 17 plots. However, the geographic pattern of the disease being present in the Teche plots and absent in the LaFourche and River plots was unexpected. A possible explanation may be related to the sources of the original seed cane of CP 76-331 for plots in the Teche compared to the other plots. I plan to resample these plots to attempt to confirm the pattern of disease. If confirmed we should think about taking steps to heat treat seed coming from plots known to be infected with RSD.

The incidence of RSD over all the plots was only 18 of 260 stalks or approximately 7%. However, it should be remembered that the level of disease found in the standing crop will increase when the cane is harvested for seed because the harvester will spread it to healthy stalks. Estimates of rate spread by the harvester of Steib and Chilton were on the order of 4 to 1 which could mean that 28% of the stalks coming from these plots would develop RSD. Clearly this would be a level of disease which would warrant heat treatment for its control.

BIOTECHNOLOGY AND SUGARCANE RESEARCH

Drs. Derrick and French of our department have developed a dot blot hybridization assay for sugarcane mosaic virus. This involved cloning a

TABLE 1. AMERICAN SUGARCANE LEAGUE SEED INCREASE STATIONS SAMPLED FOR RATOON STUNTING DISEASE IN CP 76-331.

(NO. POSITIVE STALKS/10 SAMPLED)

MISSISSIPPI RIVER	
NEW HOPE	0/10
EVAN HALL	0/10
GRAUGNARD FARMS	0/10
GLENDALE	0/10

BAYOU LaFOURCHE	
LULA	0/10
WESTFIELD	0/10
GLENNWOOD	0/10
LITTLE TEXAS	0/10
CEDAR GROVE	0/10
THIBODEAUX BROS.	0/10
LEIGHTON	0/10
RACELAND (S. COAST)	0/10
GEORGIA (S. COAST)	0/10
McLEOD	0/10

0/14 PLOTS - 0%
0/140 STALKS - 0%
SAMPLED - AUG. 13, 1984

BAYOU TECHE	
CALUMET FARMS	1/10
STERLING	1/10
STERLING	3/10
BREAUX BROS.	1/10
OAKLAWN	0/10
ALLAIN	2/10
LONGMAN-PARKS	0/10
GREAT SOUTHERN	6/10
RONALD HEBERT	0/10
ENTERPRISE	1/10
CAROLINE	1/10
TRIPLE V FARMS	3/10

9/12 PLOTS - 75%
18/120 STALKS - 15%
SAMPLED - SEPT. 5, 1984

TOTAL: 9/26 PLOTS - 35%
18/260 STALKS - 7%

part of the virus genome into a bacterial plasmid for use as a probe. The part of the radioactively labelled plasmid containing the virus genome can hybridize to the virus genome if it is present in sap extracts from plants spotted on nitrocellulose paper. The hybridization is very specific and can be detected by X-ray films placed in contact with the paper. If the sample has virus the radioactive probe hybridizes to it and develops the X-ray film revealing a dot where the sample was spotted.

The same kind of assay is being developed for detecting and quantitating RSD bacteria in diseased sugarcane. We have shown that DNA isolated from the RSD bacteria hybridizes to sap extracts of diseased plants. Thus we have a dot blot hybridization assay for RSD. Mr. Jimmy Kamso-Pratt, a graduate student working with me, has succeeded in cloning part of the RSD-DNA into a plasmid to use as a probe. We are currently testing a number of these cloned probes. We plan to use dot blot hybridization in conjunction with the alkaline induced metaxylem autofluorescence assay to re-evaluate disease incidence in the CP 76-331 plots.

Crop Genetics International has developed and will be marketing a tissue culture derived clone of sugarcane variety CP 65-357. This is referred to as Kleen-Tek material and will have as its major selling point its reported freedom from vegetatively propagated diseases such as RSD and SCMV.

Several years ago an experiment was performed to estimate the rate of spread of mosaic back into disease free varieties CP 65-357 and CP 74-383. Mosaic is spread by planting diseased material and by aphids which can rapidly acquire and transmit the virus to healthy plants. CP

65-357 when grown commercially is almost 100% infected with mosaic while CP 74-383 only takes a low frequency of disease and is considered resistant. Seed cane for the experiment was grown from selected disease free seed planted at Burden Research Center in 1982 and monitored for freedom from disease. The test was planted in the fall of 1982 at the St. Gabriel Research center. Incidence of mosaic in the plots was determined at 2 week intervals from May through August 1983, by visual examination by Mr. Frank Spooner, a graduate student working with me. Results (FIGURE 1) show that no mosaic was detected on May 4, but levels under 1% were present by June 16 in both varieties. After June 16, the susceptible CP 65-357 took off to reach approximately 8% incidence by August 16 while resistant CP 74-383 remained around 1%. Clearly the aphids were effective in introducing the disease back into the clean susceptible material just as they will be with the Kleen-Tek material. Unfortunately stubble data was not obtained to see what levels of disease would have been attained. It should be to a grower's advantage to start with disease free seed, whatever its source.

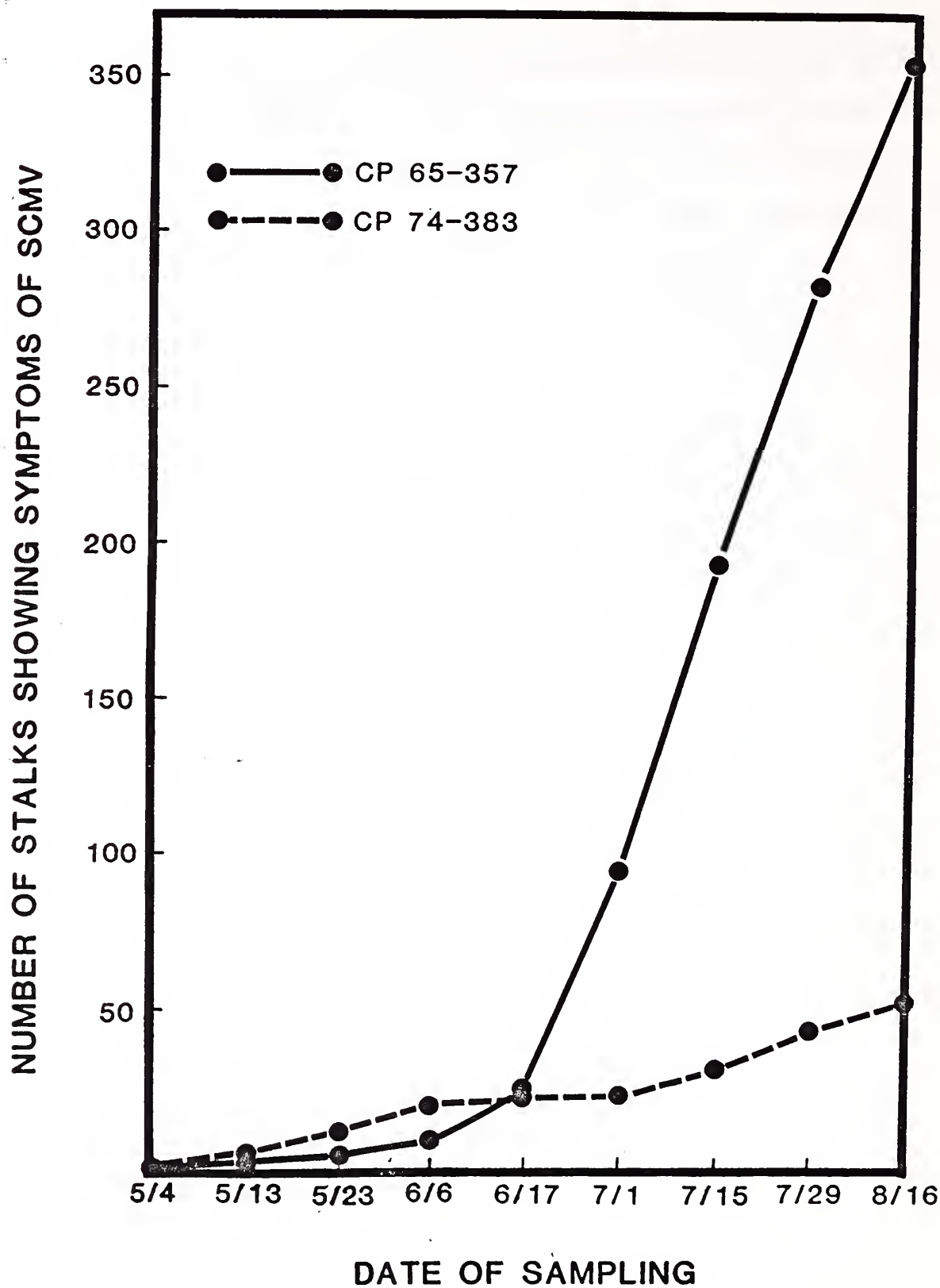

FIGURE 1. APHID VECTORED SPREAD OF SUGARCANE MOSAIC VIRUS INTO DISEASE FREE PLANT CANE AT ST. GABRIEL, LOUISIANA, 1983.

Sugarcane Entomology Annual Report 1984

T. E. Reagan

Department of Entomology

Integrated Pest Management:

A split-plot comparison (5 replications) of resistant (CP70-330), moderate (CP65-357), and susceptible (CP61-37) sugarcane varieties to the sugarcane borer (SCB) Diatraea saccharalis, each with and without arthropod predators, was conducted on plant cane at the St. Gabriel Experiment Station. Under moderate infestation pressure, use of both management components (variety resistance and arthropod predators) caused a 10-fold reduction (synergistic) of sugarcane borer moth emergence. Additionally, a differential survival ($P<0.05$) of late-stage borer larvae was observed with CP65-357 as compared to CP61-37 and CP70-330, suggesting an additional mortality factor associated with the moderately resistant variety.

Predation Ecology:

A 3-year study of arthropods found associated with ground vegetation in Southeast Louisiana sugarcane fields illustrated the beneficial impact of selected weed flora enhancing predation on the sugarcane borer. These investigations including comparisons among weed-free, grass, broadleaf, and mixed weed habitats have shown that subcompetitive stands of annual weeds (particularly the broadleaf genera Physalis and Acalypha which die back at canopy closure) enhance predatory ant (S. invicta) and spider populations early in the sugarcane production season. By providing prey and shelter, certain weed flora encouraged spiders of the families Clubionidae, Linyphiidae, and Lycosidae early season ($P<0.05$), and Theridiidae and Nesticidae late season ($P<0.05$).

Predation system stabilization through floral, and therefore faunal, diversification was shown to be a judicious and economical approach to integrated pest management in the Louisiana sugarcane ecosystem. Net returns/ha in these studies were 3-fold higher in the broadleaf habitat as compared to total weed control using recommended herbicides and cultivation. The organophosphate insecticide azinphos-methyl (Guthion), commonly used for control of the sugarcane borer, decreased system stability through food web route disruption by decreasing selected phytophagous insects, coleopterans, and spiders 35-, 51-, and 67%, respectively ($P<0.01$).

Host Plant Studies:

Predatory arthropod studies comparing larval foraging on sweet sorghum vs. sugarcane (plant cane) showed 17.9- vs. 4% (cane to sorghum) harboring Solenopsis invicta Buren ants and 9.2- vs. 1.2% with carabid larvae ($P<0.05$). Sugarcane borer larval survival from artificial infestations to the upper, middle, and lower portions of sweet sorghum stalks was 13-, 10-, and 8% ($P<0.05$), respectively; and average weights

from plots infested with 0, 5, 10, and 15 SCB larvae/plant were 1.07, 1.03, 1.02, and 1.00 kg/stalk, respectively. Such data indicates a possible role of plant density (sweet sorghum) as a management practice.

Varietal resistance on-farm test evaluations of the L81 and L82 sugarcane varietal series (4 reps) for resistance to D. saccharalis revealed four of the L82 series (L82-9, -46, -86, -89) comparable (SE±0.23) to the resistant commercial variety CP70-321. Four additional cultivars (L81-12, -30, L82-33, -76) were more resistant (P 0.05) than the moderately resistant commercially grown variety CP65-357. Four others (L82-61, -73, -74, -96) were either comparable to or more susceptible than the most SCB susceptible commercial variety (CP74-383) produced in Louisiana, as determined by bioassay.

Insecticides:

Sweet sorghum yield losses were 10.1% by weight comparing 1 insecticide application (monocrotophas) resulting in 19.5% (treated) vs. 48.6% (untreated) SCB bored internodes ($P<0.05$). Small plot insecticidal evaluations (5 reps) of alsystin (4F-0.07 kg ai/ha), flucythrinate (2E-0.03 kg ai/ha), fenvalerate (2.4E-0.13 kg ai/ha), and Otsuka OK-174 (2.4E-0.56 kg ai/ha) provided season-long SCB control (3 applications) on sugarcane comparable to the standard azinphosmethyl 2L (9.84 kg ai/ha); several rates of Union Carbide (UC-75118, -76721, -80416) and Abbott B-endotoxin of the bacterium Bacillus thuringiensis (ABG-6162) were ineffective ($P<0.05$).

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SUGARCANE PHYSIOLOGY

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Work with sugarcane ripeners was continued in an effort to find more effective and less costly yield enhancers. All work was performed with CP 70-321. In paired plots and fifteen days after treatment with 1/4 or 1/8 lb/acre Sulfosate or 1/2 lb/acre Polado, both concentrations of Sulfosate were more effective than Polado. Thirty days after treatment, 1/4 lb Sulfosate and 1/2 Polado gave similar results. The average increase in yield after thirty days was approximately 15%.

Two other potential sugar enhancers were tested separately and together. Burst was applied at 2 pt, 1 pt, and ½ pt/acre. Two applications were made both in May and August. Although the standard errors for brix and pol indicated that the data was not significant, all double applications of Burst resulted in 6% to 7% increases in sugar/acre when plants were harvested in the middle of October. The two higher rates of Burst, but not ½ pt/acre, also increased yield in a December harvest. Variable results were obtained when Burst was applied in late September or early October. Several applications resulted in decreased yields. Gibberellic acid (ProGibb) was applied separately at 28 g ProGibb/acre or in combination with 1 lb/acre Burst. Two applications of ProGibb in August resulted in approximately a 7% increase in yield when plants were harvested on October 20th. A 4% increase was obtained in December. The simultaneous application of Burst and GA usually resulted in a decrease in yield.

Research on a sugarcane spindle bioassay was completed. Spindle leaf tissue responded well to Gibberellic acid (GA), and varietal responses to GA were found., In the same tissue it was found that the cortex was the major site of growth in response to GA.

Extracellular calmodulin (CaM) was discovered for the first time in plants. CaM is a regultator of several important enzymes in plants. A RIA showed it to be present in the cell walls of sugarcane.

Glutamate oxaloacetate transaminase (GOT) was discovered for the first time in plants, and it may be important in the regulation of peroxidase activity and growth. GA causes an increase in sugarcane leaf growth, along with concomitant decreases in cell wall peroxidase, MDH and GOT. A shuttle system involving malate, oxaloacetate, aspartate and oxoglutarate is proposed to replace previous schemes involving only malate and oxaloacetate.

Factors Affecting Mechanical Harvesting and Production Efficiency of Sugarcane

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Patrick P. Chaney, Research Associate
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APPROACH:

An air carrier sprayer was modified for use in applying a ripening agent to sugarcane. This work came in response to an appeal from farmers for more information on whether an air carrier system could substitute for aerial application in fields where aerial application is not possible.

An automatic control system for a drum-type sugarcane planter has been designed. Preliminary laboratory tests have been completed. The complete system is now being readied for installation on a planter for field testing in 1985.

A feedback control system for the topper height on a sugarcane harvester has been constructed and is now being installed for field and lab testing.

RESULTS:

The air carrier sprayer was tested in the field with 3 nozzle types, 2 blower angles, and 2 carriers. The patterns obtained were neither uniform nor repeatable. This system will not be recommended to farmers.

PUBLICATIONS:

Parish, R. L., P. P. Chaney, and F. E. Sistler. 1984. Evaluation of a modified air carrier sprayer in sugarcane. American Society of Agricultural Engineers, Paper No. 84-1505.

Evaluation of Physical Properties of Sugarcane

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Objectives:

1. To evaluate some physical properties of sugarcane using different forms of radiation.

2. To determine the correlation between the physical properties and the quality of sugarcane.

Summary:

A research project to investigate the response of sugarcane samples to infrared, microwave, Gamma ray and radiofrequency radiation energy is underway in the Agricultural Engineering Department. Results of such investigation will be used to correlate these physical properties with the sugar, water, and fiber contents of the sugarcane. The stand density of the sugarcane crop in the field will also be correlated to some of the measured physical properties.

The NIR (near infrared) spectroscopy will measure the light energy absorbed by the sugarcane sample at different wavelengths and will vary with the sugar concentration and fiber content of the sample. Relationships between the light energy absorbed and sugar, water and fiber contents will be established.

Gamma ray calibration with density of the sugarcane crop in the field will be attempted. The attenuation of the radiation depends on the density and the path length, thus correlation to the biomass in the field of sugar cane is possible.

The microwave radiation will be applied in two different ways. The first method will be the direct measurement of the amount of microwave absorbed. The second method will be the indirect use of microwave to evaporate water in the sample and through weighing process determine the moisture content. Samples of shredded sugarcane were dried in a household microwave oven. Results were compared with those from conventional drying in hot air oven. The microwave method provided reliable and accurate moisture values and was much faster.

The NMR (nuclear magnetic resonance) also will be used to estimate sugar, water and fiber content of samples of sugarcane. These measurements are made in relation to the amount of radiofrequency absorbed when the sample is exposed to a constant magnetic field. The amount of radiation absorbed by the sample will depend on the number of hydrogen nuclei present in the sample.

SOIL AND WATER MANAGEMENT

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Field Research Facilities Expanded:

The USDA-ARS Soil and Water Management Research Unit at Baton Rouge has expanded its field research facilities. For several years, emphasis was on subsurface drainage, but recent work has also included subsurface irrigation. The concept of adding water through subsurface drains to subirrigate has been successful on 0.01 - and 1.0-acre plots in Louisiana. It is now being tested on a much larger scale.

With the help of the American Sugar Cane League, Dugas and LeBlanc Ltd., and the USDA-SCS, a water management system, 17 acres in size, was completed in 1984 on the Westfield Plantation in Paincourtville.

The water management system consists of a network of underground drains that empty into three sumps equipped to pump drain outflow into surface drainage ditches during rainy, wet conditions. Irrigation wells, one for each sump, were installed and equipped to pump water into the sumps and throughout the subsurface drain network to provide subirrigation during droughts. The pumps for drainage and irrigation are controlled by switches activated by the water level in the sumps.

Previous research work has shown that subsurface drainage increased sugarcane and sugar yields. With a system that allows both subsurface drainage and subirrigation, further increases in cane and sugar yields are expected.

Subsurface Drainage Slows Sugarcane Yield Decline:

Seven experiments were conducted in south Louisiana from 1967 through 1984 to determine the effects of subsurface drainage on sugarcane and sugar yields. Each experiment consisted of two treatments: drained (subsurface drained) and nondrained (not subsurface drained). The drained and nondrained treatments resulted in relatively low and high water tables, respectively, in the experimental areas. The experiments and their respective areas were: one experiment on 0.01 acre plots through four ratoons; two experiments, one on 0.01 acre plots and the other in a 10-acre field, was through three ratoons; and four experiments in 1-acre or larger plots through two ratoons. Normally, only two ratoons are grown in Louisiana because yields decline below profitable levels after the second ratoon.

In each experiment, the average cane and sugar yields from the subsurface drained areas were higher than those from nondrained areas. Furthermore, the annual decline in yields occurred at a much slower rate in the subsurface drained areas. The rate of yield decline was determined by correlating yields with years for each experiment.

The rate of cane yield decline from all seven experiments averaged 6.9 and 3.1 tons of cane per acre per year from the nondrained and drained treatments, respectively. Based on these data, typical yields from a nondrained field would be 35 T/A, 28.1 T/A and 21.2 T/A for the first three years and yields from a subsurface drained field would be 35 T/A, 31.9 T/A, 28.8 T/A, 25.7 T/A, and 22.6 T/A for the first through fifth year. Additional ratoon crops, which these data show could be obtained with subsurface drainage, would be an economic boost to sugarcane growers in Louisiana because replanting sugarcane is an expensive operation.

The rate of sugar yield decline averaged 1167 pounds and 767 pounds per acre per year for nondrained and drained areas, respectively. Based on these data, typical sugar yields from a nondrained field would be 5000 lbs/A, 3833 lbs/A, and 2666 lbs/A for the first three years and yields from a subsurface drained field would be 5000 lbs/A, 4233 lbs/A, 3466 lbs/A, and 2699 lbs/A for the first through fourth years.

This experiment shows that subsurface drainage slows the rate of decline in cane and sugar yields and increases the number of economically feasible ratoon crops. This additional economic benefit from subsurface drainage should enhance the use of subsurface drainage for sugar production in Louisiana.

The Department of Agricultural Economics and Agribusiness Research Program For Sugarcane and Related Crops in South Louisiana

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The departmental research program in sugarcane recognizes three distinct, yet interrelated areas of study. These are defined as:

1) Micro/short run
2) aggregate/intermediate run
3) sectorial/long run

Current research activities concentrate research resources in addressing micro and aggregate problems, as these efforts provide the fundamental information needed to address sectorial problems.

I. Micro research activities:

A. Detailed cost studies associated with the production of sugarcane and its conversion to raw sugar are ongoing. Considerable refinement in producer cost of production and returns projections have been affected since 1981. Annual projections are published in January to assist farmers, suppliers of production inputs, lenders and others with an interest in agricultural activities.[1] These data indicate that Louisiana sugarcane producers have done a tremendous job in fashioning the most cost effective agronomic and mechanical technological package within the American sugar industry. Relevant physical and economic data are summarized in Table 1.

Table 1. Selected Physical, Cost of Production and Returns Data, Louisiana Sugar Industry 1981-84.

Year	Number Farms	Number Mills	Acres Sugarcane	Production Cost/lb of Raw Sugar Cents VC	Production Cost/lb of Raw Sugar Cents TC	Margin/ Pound Cents	Estimated Grower Net Returns/Acre of Land in Sugarcane Dollars
1981	800	23	265,000	.12	.18	1.73	25.16
1982	768	21	250,000	.12	.19	.93	18.29
1983	737	21	265,000	.13	.19	3.04	59.95
1984	650	21	230,000	.11	.19	2.86	50.79

[1] DAE 592, 608, 626, 636.

B. Economic evaluation of recommended and emerging technological production innvovations has been and is being done.

1. An economic appraisal of heat treatment to control Ratoon Stunting Disease conducted in 1982 has attracted interest in the sugar industry nationally and internationally. This study indicated the RSD heat treatment program recommended by the Louisiana Agricultural Experiment Station would provide farmers using the practice about 11½ dollars of net revenue per dollar invested.

2. An economic analysis of the feasibility for incorporating wheat into the fallow segment of the sugarcane rotation was done in 1983. This analysis indicated wheat could be used to reduce fallow costs if custom combining were available particularly for small acreages. This work has been expanded to incorporate the impact on cash flow and utilization of lumpy input resources.

3. A detailed economic study of cane hauling alternatives was done in 1984. This study established long run costs for various options and addressed short run distortions associated with real world situations. Factory managers have shown considerable interest in this data as a basis for establishing hauling rebates; growers are also using the data to establish costs for hauling options they are interested in and the analytical framework for comparing "in place" vs. new alternatives.

4. An evaluation of the economic impact and potential of subsurface drainage is being conducted as a joint effort between research personnel in the Departments of Agricultural Engineering and Economics. Preliminary results should be available prior to the end of this year.

C. Micro economic or firm resource allocation and supply response studies have been implemented. These activities have resulted in the development of farm simulation models that may be used to assess how exogenous and or endogenous change impact on the cropping system as well as firm structure and size.

A simulation model for small farms utilizing one row machinery is in place and functional. The economic impact of an alternative rotational program has been evaluated (40/40/20 or 29% fallow and plant, plant cane, and 1st stubble respectively, and 14% 2nd stubble). The results indicated that a significant increase in overall output should result. However, the economic outcome does not increase grower net returns. This study is being expanded to determine how much second stubble yields must rise to justify grower acceptance of this rotational system.

Questions concerning economic thresholds for 3rd stubble have been addressed. Preliminary results indicate raw sugar yields would have to exceed 3160 pounds per acre to justify retention at current product price levels. Refinement of output estimates by soil type are being developed and the analysis broadened to ascertain how factor endowment constraints such as soil type might affect allocation of resources, rotational alternatives, and income.

A simulation model for large commercial sugarcane farms using 3-row machinery is being brought on line. This model will be used to address adjustment and resource allocation questions associated with land use (rotational alternatives) and new harvest technology.

D. Evaluation of the performance efficiency of Louisiana sugar factories and the associated effectiveness in the utilization of variable and fixed resources is another focus of research activity.

Detailed cost studies for raw sugar factories in Louisiana are being done. Factories must exist if farmers are to produce cane, furthermore,

factory closure affects efficient and inefficient cane growers alike. Factories provide a unique package of processing and marketing services to growers. Payment is made "in kind" rather than in cash. This service-remuneration arrangement has a direct and material effect on cane producers' cost and returns. Thus, it is imperative that economic information providing insight into the cost structure of factories be maintained to facilitate evaluation of technological change and the resulting impact on cost per relevant unit of output.

II. Aggregate research activities:

Aggregate economic analysis is a "forward looking" process, aimed at identifying the direction of the response to forces external or internal to the farm and resource base rather than the actual magnitude. Fundamental to such an analysis are: 1) acceptable input/output data for farm firms and primary processors of agricultural products; 2) models that are flexible enough to handle a variety of "what if" questions and; 3) an adequate quantification of the geographic area factor endowments is essential in identifying relevant constraints (physical, institutional, infrastructural, cultural, and economic) that affect either change or the rate of that change.

The simulation models discussed in I.C. above coupled with detailed factor endowment data, provides a basis to establish relevant "representative firms" and that portion of the physical factor endowment tied to a given segment of the population. Physical and service input requirements can be estimated and primary processing demands projected. Response to real or anticipated external or internal forces can be generated, furnishing economic information to individuals and groups within the study area interested in the potential consequences of such change prior to its occurrence.

III. Sectorial research activities:

Sectorial research is designed to interface regionalized research activities within a "holistic" framework. This offers a unique opportunity for providing private and public decision makers insight into what could be the direct economic impact of modifications in current policies and strategies within the agricultural sector as well as the indirect impact on allied agricultural supply and service and non-agricultural sectors. Such an activity acknowledges the uniquiness of definable geographical production areas; and at the same time recognizes that physical and economic relationship, either supplementary, complementary or competitive in nature, link these definable areas together. It is within this framework that change and its impact on the employment of those production and marketing resources particular to the sugar industry may be evaluated. Production and marketing resources that are used within the sugar industry yet common with other crop and livestock industries within the state are also considered.

National, regional, and state agencies are using whatever data is available to formulate policies, strategies, and priorities dealing with import quotas, export policies, the allocation of energy and other scarce resources, and other related areas. Historically, agriculture has not fared badly. However, as resource scarcity intensifies, hard and supportable facts will be required to justify allocation decisions. This is particularly crucial to the sugar industry as farms utilize sizeable quantities of energy based inputs and raw sugar factories use large amounts of energy and water in the production process.

Sectorial research is a logical extension of an individual research effort into a departmental research program. The concept utilizes micro research as input to develop a sectoral analysis. Considerable coordination and interaction among departmental researchers would be required to identify and quantify the interface between and among production areas and their utilization of existing institutional, infrastructural and other common resources.

Research results would provide estimates of change in economic activity within the sector as well as the impact such change would have on economic activity outside the sector. Such information could be instrumental in generating favorable support from other sectors of the state economy for more positive positions and strategies relating to agricultural activity within Louisiana.

DAE 592, 608, 626, 636.

Cultural Practices for Sugarcane[1/]

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Experiments on cultural practices were continued in 1984 to determine the effects of method of planting, date of planting, succession planting, fertilization, date of harvest, stubble protection and stubble cane longevity on the yield of current varieties of sugarcane in Louisiana. The experiments were conducted in cooperation with the St. Gabriel Research Station and cane growers.

The weather conditions were less than adequate to produce high yields of sugarcane in 1984. A severe freeze of 10°F during December of 1983 damaged some of the cane stubble and planted cane resulting in abnormally poor stands and a delay in early cane growth. However, some of the yield loss was minimized by increase stooling in late spring and unusually warm weather in October.

Method of Planting:

One experiment was conducted with plant cane to determine the possibility of interaction between widths of planting furrow and varieties of cane. The furrow widths tested were 18, 24 and 36 inches on a standard row spacing and the varieties were CP 72-370 and CP 74-383. A V-furrow was planted with each variety as a check plot. The yield data obtained in this test are reported in Table 1. In most comparisons, the increases in cane and sugar yields from each furrow width were significant with the two cane varieties. However, the increases were larger with CP 72-370 than CP 74-383. The cane yield increases with CP 72-370 were 22.4%, 29.4% and 34.7% over the V-furrow yield with the 18, 24 and 36-inch furrows, respectively. The increases with CP 74-383 were 7.1%, 15.0% and 6.9% with the 18, 24 and 36-inch furrows, respectively. Apparently, the CP 74-383 cane on the 36-inch furrow was damaged during cultivation.

Another experiment was continued in 1984 from a plant cane test in 1983 to determine the effects of width of planting furrow on the first stubble yield. The furrow widths were 18, 24 and 36 inches on a standard row spacing and the varieties were CP 72-370 and CP 74-383. The data reported in Table 2 show that the yield was lower with CP 72-370 than CP 74-383, but the yield responses to the furrow widths tested were similar with each variety. As an average of varieties, increases up to 11.6% in cane yield and up to 16.5% in stalk populations were obtained from the wide furrow method of planting with first stubble cane.

Date of Planting:

An experiment was initiated to determine the effects of planting dates on the plant cane yield of four current varieties of sugarcane. The dates tested

1/ This research was supported in part by grant funds from the American Sugarcane League and the Potash and Phosphate Institute and by sugarcane growers.

were August 30, September 26 and October 27 and the varieties were CP 65-357, CP 70-321, CP 72-370 and CP 74-383. The varieties were planted on each date in 1983 and harvested as plant cane in November, 1984. The data are reported in Table 3. Each variety produced significantly more plant cane yield when the cane was planted in September than in August or October. CP 74-383 produced more yield than the other varieties on each planting date. As an average of varieties, the yield from cane planted in September was higher than August and higher in August than October.

Another test was continued from plant cane in 1983 to determine the effects of planting dates on the first stubble yield of four varieties. The dates were August 25, September 28 and October 27 and the varieties were CP 65- 357, CP 70-321, CP 72-370 and CP 74-383. The varieties were planted in 1982 and harvested as plant cane in November, 1983 and as first stubble in October, 1984. The yield data obtained with first stubble are reported in Table 4. As with plant cane in this test in 1983, generally, each variety produced progressively less yield of first stubble cane as the planting date was delayed from August to October. The planting dates affected yield the least with CP 65-357 and CP 72-370 and the most with CP 74-383. As an average of varieties, the yields from the September and October plantings were similar, but lower than from the August planting.

The effects of planting dates on yield differ among years. Apparently, the effects are dependent to some extent on amount of plant growth prior to a killing freeze and the date and severity of the freezes during the winter months.

Fertilization of Succession Cane:

A test was initiated to compare the fertilizer needs of plant cane planted after a fallow year and also planted in succession immediately after harvesting a cane crop. The test was conducted with variety CP 74-383 on Commerce silt loam soil on the St. Gabriel Research Station. Fertilizer treatments were applied in the planting furrow during the fall of 1983 and in the off-bar furrow during the spring of 1984. The treatments consisted of 0-0-0 and 90-90-90 fertilizer applied in the fall in combinations with 120-0-80 and 240-0-160 fertilizers applied in the spring to fallow and succession planted cane. The data obtained from this test are reported in Table 5. A factorial analysis of the data showed that the cane yield was significantly higher with the fallow than succession planted cane and with the fall application as compared to no fertilizer in the fall. The yield increase from the fall application was larger with succession than fallow planted cane. The yield differences between the spring treatments were small.

Another test was continued from plant cane in 1983 to compare the fertilizer needs of first stubble cane from cane planted after a fallow year and in succession. The test was with varieties CP 65-357 and CP 72-370 on Commerce silt loam soil. The fertilizer treatments were 80-0-60, 160-0-120 and 240-0-180 applied to first stubble cane of fallow and succession planted cane of each variety. The data are reported in Table 6. The first stubble yields were higher from fallow than succession planted cane with CP 72-370 but not with CP 65-357. The response to the fertilizer treatments approached significance only with succession planted CP 72-370. As in plant cane in 1983, the results indicate a lower fertility status in the soil without a

fallow year between cycles of cane and a need for relatively high rates of fertilizers with succession planted cane.

Fertilization of High Population Cane:

A fertilizer test was initiated with high population sugarcane planted by the wide furrow method of planting after a fallow year on Commerce silt loam soil on the St. Gabriel Research Station. The test was with plant cane of variety CP 72-370. The extractable soil P was relatively high and only rates of N and K were tested at this location. The fertilizer treatments were 120 and 240 pounds of nitrogen and 0, 60, 120 and 180 pounds of potash per acre. The data obtained are reported in Table 7. The cane yield produced with 120 pounds of nitrogen was significantly higher than that of the check plot. Generally, the yield responses to applied potash were positive and approached significance. For each rate of potash tested, the cane yield was higher with 240 as compared to 120 pounds of nitrogen. The differences in stalk populations among fertilizer treatments were small. The weight per stalk was significantly larger with each treatment than the check plot. The differences in sucrose content were small and the differences in sugar per acre were similar to the ones obtained in cane yield.

Bagasse and Fertilizer Application:

An experiment was continued to test the effects of cane bagasse and fertilizer rates on the yield of sugarcane on Commerce silt loam soil on Cinclare Plantation in Port Allen, La. Bagasse at the rates of 0, 30 and 60 tons of dry matter per acre was broadcasted and disked into the soil during the fallow year prior to planting cane variety CP 70-321 in 1982. The test was initiated with different fertilizer rates at each bagasse rate with plant cane in 1983 and continued with first stubble cane in 1984. The fertilizer rates with first stubble consisted of 0-0-0 and 160-0-90 with each bagasse rate and 320-0-180 with the 30 and 60 T/A bagasse rates. Anhydrous ammonia and liquid potash were used as the sources of fertilizers.

The data obtained from this test are reported in Table 8. The yield increase with first stubble from the 60 T/A rate of bagasse without applied fertilizer approached significance. The yield increases from the 160-0-90 fertilizer without bagasse and 320-0-180 fertilizer with 30 T/A of bagasse were significant.

Date of Harvest:

Experiments on date of harvesting current sugarcane varieties were conducted on the St. Gabriel Research Station. One test was initiated in 1983 to determine the effects of harvesting plant cane on the yield of the following first stubble crop in 1984. Plant cane of varieties CP 65-357, CP 70-321, CP 72-370 and CP 74-383 was harvested on September 1, October 1, November 1 and December 1 in 1983. The first stubble was harvested in November, 1984 and the yield data are reported in Table 9. The effects of date of harvesting plant cane on the following stubble yield were similar with varieties CP 65-357, CP 70-321, and CP 72-370. The yields of these three varieties were highest from the September harvest date and lowest from the November date. The yield of CP 74-383 was highest from the September harvest and lowest from the December harvest date of plant cane.

Another test was initiated to determine the effects of date of harvesting plant cane on the yield of plant cane in 1984 and first stubble cane in 1985. Plant cane of varieties CP 65-357, CP 70-321, CP 72-370 and CP 74-383 was harvested on September 1, October 1, November 1 and December 1 in 1984. Due to harvesting problems affecting the yield data, only the results from the October and November harvest dates are reported in Table 10. The weather was unusually warm during October, 1984 and the cane continued to grow until harvest time. The increases in cane yield during October were similar with CP 65-357, CP 70-321 and CP 74-383 averaging 6.1 T/A. The increase was 12.4 T/A with CP 72-370. As an average of varieties, the sucrose content increased from 11.5% to 13.5% during October.

Stubble Protection:

Experiments were conducted on stubble protection from freeze damage to possibly increase the yield and longevity of stubble cane. The protection treatments consisted of covering the cane stubble with approximately three inches of soil after harvesting a crop and a check plot without covering. The soil cover was applied in November prior to the occurrence of a freeze and the cover was removed in the spring with a stubble shaver.

In one test, plant cane of varieties CP 65-357 and CP 72-370 was harvested on September 1, October 1 and November 1 in 1983. The soil cover treatment was applied in November to the cane stubble of each variety from each harvest date. The data with first stubble are reported in Table 11. The effect of stubble protection on yield was dependent on date of harvest and variety of cane. The cover treatment increased the first stubble cane yield 28.2% and 35.0% with CP 65-357 and 24.3% and 74.0% with CP 72-370 where plant cane was harvested September and November, respectively. The effect of the soil cover with the October harvest date of each variety was surprisingly small. The height of the stubble regrowth from the October harvest was intermediate between the regrowth from the September and November harvest. Apparently the damage from a 10°F freeze in December was less on stubble with this intermediate regrowth.

In another test, varieties CP 65-357 and CP 72-370 was planted in furrow widths of V, 18, 24 and 36 inches wide in 1980 and the plant and first stubble cane crops were harvested to determine the effects of furrow widths on yield. Soil covering treatment was applied to the cane stubble after the first stubble harvest in 1982 and after the second stubble harvest in 1983. The average yields of the two varieties in the third stubble crop in 1984 are reported in Table 12. The cover treatment increased cane yield 9.7, 20.0, 26.9 and 20.6% over the uncovered check plot with cane planted in V, 18, 24 and 36-inch furrows, respectively. As an average of varieties and furrow widths, the cover treatment produced 5.1 T/A more cane than the check plot. These results indicate that stubble protection can increase yield of third stubble cane and possibly increase the longevity of a crop cycle.

Table 1. Effect of planting furrow width on the plant cane yield of two varieties of sugarcane on Commerce soil on the St. Gabriel Station, 1984.

Variety of cane	Drill width	Plant cane yield	Stalk		Normal juice		Sugar yield
			No.	Wt.	Brix	Sucrose	
	in.	T/A	1000/A	lbs.	%	%	lbs./A
CP 72-370	V	30.3	22.0	3.0	15.0	12.1	5039
	18	37.1	29.0	3.0	15.1	12.4	6362
	24	39.2	28.3	2.8	15.2	12.4	6735
	36	40.8	29.4	2.9	15.2	12.7	7230
CP 74-383	V	44.9	33.9	3.0	14.4	11.4	6971
	18	48.1	39.7	2.7	14.6	11.6	7589
	24	51.5	37.9	2.9	14.9	12.0	8511
	36	48.0	37.8	2.8	14.7	11.6	7570
HSD .05		4.5	3.8	NS		1.2	1061
			Mean drill width effect				
	V	37.6	28.0	3.0	14.7	11.7	6005
	18	42.6	34.3	2.9	14.9	12.0	6976
	24	45.4	33.1	2.9	15.1	12.2	7623
	36	44.4	33.6	2.9	15.0	12.1	7400
HSD .05		2.7	2.2	NS		NS	622

Table 2. Effect of planting furrow width on first stubble yield of two varieties of sugarcane on Commerce soil on the St. Gabriel Station, 1984.

Variety of cane	Drill width	Stubble cane yield	Stalk		Normal juice		Sugar yield
			No.	Wt.	Brix	Sucrose	
	in.	T/A	1000/A	lbs.	%	%	lbs./A
CP 72-370	V	29.8	26.5	2.5	16.3	13.4	5630
	18	31.2	28.2	2.7	15.8	12.7	5547
	24	30.6	29.8	2.4	15.8	12.8	5459
	36	33.7	31.0	2.4	16.3	13.4	6385
CP 74-383	V	40.9	31.8	2.3	16.1	13.0	7449
	18	41.7	35.5	2.5	15.9	12.6	7320
	24	44.8	34.1	2.4	16.3	12.9	8116
	36	45.2	36.8	2.5	15.8	12.6	7944
HSD .05		1.8	3.2	NS		NS	1087
			Mean drill width effect				
	V	35.4	29.1	2.4	16.2	13.2	6540
	18	36.5	31.8	2.6	15.9	12.7	6433
	24	37.7	32.0	2.4	16.1	12.8	6788
	36	39.5	33.9	2.5	16.1	13.0	7165
HSD .05		1.1	1.9	NS		NS	638

Table 3. Effect of date of planting on the plant cane yield of four varieties of sugarcane on Commerce soil on the St. Gabriel Station, 1984.

Variety of cane	Date of planting	Plant cane yield	Stalk		Normal juice		Sugar yield
			No.	Wt.	Brix	Sucrose	
		T/A	1000/A	lbs.	%	%	lbs./A
CP 65-357	Aug. 30	33.3	28.4	2.6	16.7	13.6	6423
	Sept. 26	39.0	27.0	2.9	16.7	13.6	7489
	Oct. 27	30.9	24.3	2.8	16.3	13.1	5703
CP 70-321	Aug. 30	36.8	30.7	2.9	16.6	13.9	7260
	Sept. 26	43.3	32.0	3.0	17.3	14.6	9112
	Oct. 27	32.6	30.5	3.1	16.3	13.5	6234
CP 72-370	Aug. 30	36.7	28.6	2.9	16.5	13.6	7091
	Sept. 26	43.2	30.3	3.2	15.2	12.2	7266
	Oct. 27	34.6	26.1	3.0	15.7	12.7	6133
CP 74-383	Aug. 30	42.8	35.9	2.9	16.0	13.0	7813
	Sept. 26	50.9	37.3	3.2	15.9	12.9	9200
	Oct. 27	39.1	28.8	3.0	15.5	12.4	6716
HSD .05		3.9	7.5	0.6		2.4	1887
			Mean date effect				
	Aug. 30	37.4	30.9	2.8	16.5	13.5	7147
	Sept. 26	44.1	31.6	3.1	16.3	13.3	8267
	Oct. 27	34.3	27.4	3.0	16.0	12.9	6169
LSD .05		1.4	2.6	0.2		NS	652

Table 4. Effect of date of planting on the first stubble yield of four varieties of sugarcane on Commerce soil on the St. Gabriel Station, 1984.

Variety of cane	Date of planting	Stubble cane yield	Stalk		Normal juice		Sugar yield
			No.	Wt.	Brix	Sucrose	
		T/A	1000/A	lbs.	%	%	lbs./A
CP 65-357	Aug. 25	29.4	30.8	2.5	17.1	14.1	5925
	Sept. 28	24.7	27.8	2.3	17.1	14.2	5012
	Oct. 27	26.8	30.2	2.3	16.6	13.5	5143
CP 70-321	Aug. 25	34.0	31.4	2.7	17.0	14.3	6952
	Sept. 28	30.2	32.2	2.6	17.3	14.5	6276
	Oct. 27	28.3	29.5	2.3	17.5	14.6	5917
CP 72-370	Aug. 25	29.8	27.6	2.6	16.1	12.9	5364
	Sept. 28	27.1	28.1	2.6	16.6	13.8	5287
	Oct. 27	26.5	26.7	2.6	16.2	13.1	4888
CP 74-383	Aug. 25	45.2	35.7	2.5	16.2	12.8	8098
	Sept. 28	36.7	39.6	2.5	16.7	13.5	7038
	Oct. 27	33.9	30.1	2.5	16.3	13.0	6201
HSD .05		3.9	4.3	0.5		2.1	1337
			Mean date effect				
	Aug. 25	34.6	31.4	2.6	16.6	13.5	6585
	Sept. 28	29.7	31.7	2.5	16.9	14.0	5903
	Oct. 27	28.9	29.1	2.4	16.7	13.6	5537
LSD .05		1.4	1.5	NS		NS	462

Table 5. Effect of fall and spring application of fertilizers on the yield and yield components of plant cane planted in succession and after a fallow year on Commerce silt loam soil at the St. Gabriel Research Station, 1984.

Fertilizer N-P_2O_5-K_2O		Plant cane	Stalk		Normal juice		Sugar
Fall	Spring	yield	No.	Wt.	Brix	Sucrose	yield
lbs./A	lbs/A	T/A	1000/A	lbs.	%	%	lbs./A
			Succession CP 74-383				
0-0-0	120-0-80	31.5	28.5	2.7	15.3	12.5	5506
	240-0-160	31.7	30.6	2.6	14.8	11.7	5111
90-90-90	120-0-80	34.2	28.4	2.6	15.3	12.4	5902
	240-0-160	35.1	28.0	2.8	14.9	12.1	5843
			Fallow CP 74-383				
0-0-0	120-0-80	36.0	31.8	2.9	15.1	12.1	6047
	240-0-160	37.5	34.0	3.0	15.3	12.4	6475
90-90-90	120-0-80	37.7	30.5	2.6	15.6	12.7	6663
	240-0-160	39.4	32.0	2.8	15.5	12.6	6901
HSD .05		3.5	3.5	NS		NS	1474

The succession cane was planted immediately following a harvested cane crop and the fallow cane was planted after a fallow year between cane cycles in 1983. Variety CP 74-383 was planted in the test and the crop was fertilized in April and harvested in November, 1984.

The extractable soil K, Ca, Mg and P were 79, 2274, 389 and 200 ppm, respectively, with a soil organic matter of 1.16% and pH 7.6.

Table 6. Effect of rates of fertilizer application on the yield and yield components of two varieties of first stubble planted in succession and after a fallow year on Commerce silt loam soil at the St. Gabriel Research Station, 1984.

Fertilizer applied $N-P_2O_5-K_2O$	Stubble cane yield	Stalk		Normal juice		Sugar yield
		No.	Wt.	Brix	Sucrose	
lbs./A	T/A	1000/A	lbs.	%	%	lbs./A
		Succession CP 65-357				
120-0-80	28.1	20.3	2.6	16.6	13.7	5451
240-0-160	27.4	21.2	2.4	16.0	13.2	5073
360-0-240	29.5	24.5	2.5	16.1	13.2	5528
		Fallow CP 65-357				
120-0-80	27.0	21.2	2.5	15.7	12.7	4791
240-0-160	27.1	23.5	2.5	15.5	12.6	4747
360-0-240	25.4	29.0	2.3	15.9	12.9	4601
		Succession CP 72-370				
120-0-80	25.4	18.3	2.4	15.9	13.1	4666
240-0-160	27.2	19.1	2.6	15.9	12.9	4891
360-0-240	29.8	22.8	2.5	15.7	12.7	5316
		Fallow CP 72-370				
120-0-80	32.2	23.8	2.5	15.3	12.4	5546
240-0-160	32.3	22.1	2.6	15.2	12.3	5523
360-0-240	30.6	23.2	2.4	16.4	13.5	5856
HSD .05	5.4	6.2	NS		NS	1375

The succession cane was planted immediately following a harvested cane crop and the fallow cane was planted after a fallow year between cane cycles in 1983. The first stubble cane was fertilized in April and harvested in November, 1984.

The extractable soil K, Ca, Mg and P were 87, 1621, 263 and 166 ppm, respectively, with a soil organic matter of 1.07% and pH 6.3. The soil sample was taken on the fallow land.

Table 7. Effect of rates of fertilizer application on the yield and yield components of plant cane on Commerce silt loam soil at the St. Gabriel Research Station, 1984.

Fertilizer applied $N=P_2O_5-K_2O$	Cane yield	Stalk		Normal juice			Sugar yield
		No.	Wt.	Brix	Sucrose	Purity	
lbs./A	T/A	1000/A	lbs.	%	%	%	lbs./A
0-0-0	27.0	24.9	2.1	16.5	13.7	82.9	5228
120-0-0	31.5	26.5	2.7	16.1	13.2	82.3	5871
120-0-60	29.7	25.4	2.7	15.8	12.8	81.3	5341
120-0-120	31.0	27.9	2.6	15.7	12.8	81.4	5550
120-0-180	34.1	27.2	2.8	15.5	12.6	81.1	5995
240-0-60	33.1	26.3	2.8	16.0	13.2	82.5	6184
240-0-120	36.2	28.0	2.7	16.0	13.2	82.5	6704
240-0-180	36.7	28.6	2.8	16.6	13.8	83.1	7107
HSD .05	4.3	NS	0.5		NS		1475

The experiment was conducted with variety CP 72-370 and the cane was fertilized in April and harvested in November, 1984.

The extractable soil K, Ca, Mg and P were 62, 1566, 277 and 249, respectively, with a soil organic matter of 1.47% and pH 6.8. The soil sample was taken on the untreated check plot.

Table 8. Effect of rates of fertilizer and cane bagasse applications on the yield and yield components of first stubble on a Commerce silt loam soil on Cinclare Plantation, Port Allen, La., 1984.

Cane bagasse applied	Fertilizer applied N-P_2O_5-K_2O	Stubble cane yield	Normal juice		Sugar yield
			Brix	Sucrose	
T/A	lbs./A	T/A	%	%	lbs./A
0	0-0-0	25.0	16.3	13.2	4648
	160-0-90	32.0	17.0	13.8	6270
30	0-0-0	25.8	16.0	13.2	4801
	160-0-90	28.9	16.6	13.5	5525
	320-0-180	30.0	16.9	13.7	5837
60	0-0-0	28.2	15.9	12.8	5051
	160-0-90	30.9	15.9	12.5	5368
	320-0-180	31.2	17.0	14.2	6325
HSD .05		3.7		NS	693

The bagasse was broadcasted and disked into the surface soil prior to building rows for planting during the fallow year in 1982. The test was conducted with CP 70-321 and the cane was fertilized in April and harvested in November, 1984.

The extractable soil K, Ca, Mg and P were 117, 2276, 369 and 228 ppm, respectively, with a soil organic matter of 1.83% and pH 6.0. The soil sample was taken on the untreated check plot.

Table 9. Effect of date of harvest plant cane on the yield of the subsequent stubble cane of four varieties on Commerce soil on the St. Gabriel Research Station, 1984.

Variety of cane	Date of plant cane harvest	Stubble cane yield	Stalk		Normal juice		Sugar yield
			No.	Wt.	Brix	Sucrose	
		T/A	1000/A	lbs.	%	%	lbs./A
CP 65-357	Sept. 1	31.0	27.3	2.3	17.1	14.2	6273
	Oct. 1	27.5	23.4	2.1	16.4	13.2	5123
	Nov. 1	22.7	24.2	1.9	16.2	13.2	4215
	Dec. 1	26.9	25.9	2.3	16.8	13.7	5246
CP 70-321	Sept. 1	33.1	25.4	2.4	17.2	14.5	6883
	Oct. 1	32.9	27.8	2.4	17.0	14.1	6620
	Nov. 1	24.8	25.5	2.2	16.8	13.9	4935
	Dec. 1	33.3	25.0	2.5	16.8	13.9	6553
CP 72-370	Sept. 1	35.4	27.2	2.4	16.7	13.7	6880
	Oct. 1	34.8	26.3	2.5	16.5	13.6	6706
	Nov. 1	26.9	20.6	2.6	16.0	12.9	4842
	Dec. 1	29.7	23.9	2.5	16.3	13.5	5672
CP 74-383	Sept. 1	43.3	36.2	2.4	15.7	12.4	7460
	Oct. 1	41.7	32.0	2.5	16.1	12.8	7464
	Nov. 1	39.4	27.4	2.4	16.5	13.6	7562
	Dec. 1	39.1	31.2	2.5	16.3	13.0	7146
HSD .05		3.8	4.1	0.5		2.2	1256
			Mean date effect				
	Sept. 1	35.7	29.0	2.4	16.7	13.7	6874
	Oct. 1	34.2	27.4	2.4	16.5	13.4	6478
	Nov. 1	28.4	24.4	2.3	16.4	13.4	5388
	Dec. 1	32.2	26.5	2.4	16.6	13.5	6154
HSD .05		1.4	1.5	NS		NS	458

Table 10. Effect of date of harvest on the yield of four varieties of plant cane on Commerce soil on the St. Gabriel Research Station, 1984.

Variety of cane	Date of harvest	Plant cane yield	Stalk wt.	Normal			Sugar yield
				Brix	Sucrose	Purity	
		T/A	lbs.	%	%	%	lbs./A
CP 65-357	Oct. 1	24.1	1.9	15.2	11.4	74.8	3739
	Nov. 1	29.1	2.2	16.7	13.5	80.8	5538
CP 70-321	Oct. 1	24.2	2.0	15.5	11.9	76.7	3934
	Nov. 1	30.6	2.8	17.4	14.5	83.4	6380
CP 72-370	Oct. 1	25.4	2.0	14.8	11.1	75.4	3829
	Nov. 1	37.8	2.6	16.3	13.2	81.0	7041
CP 74-383	Oct. 1	34.9	2.0	15.5	11.6	75.2	5558
	Nov. 1	41.7	2.8	16.2	12.9	79.7	7513
HSD .05		5.7	0.4		1.6		1274
				Mean date effect			
	Oct. 1	27.1	2.0	15.3	11.5	75.5	4264
	Nov. 1	34.8	2.6	16.7	13.5	81.2	6618
HSD .05		1.7	0.1		0.5		387

Table 11. Effect of stubble protection after three harvest dates of two cane varieties on the yield of the subsequent stubble crop on the St. Gabriel Research Station, 1984.

Date of harvest	Stubble protection treatment	Cane yield	Stalk		Normal juice		Sugar yield
			No.	Wt.	Brix	Sucrose	
		T/A	1000/lbs.	lbs.	%	%	lbs./A
			CP 65-357				
Sept. 1	Check	27.7	26.1	2.5	17.6	14.3	5668
	Cover	35.4	27.4	2.1	17.4	14.3	7266
Oct. 1	Check	27.4	28.2	2.1	16.4	13.2	5104
	Cover	27.3	27.1	2.1	16.4	13.2	5088
Nov. 1	Check	25.2	16.4	2.0	16.3	13.3	4703
	Cover	31.0	20.0	2.1	17.3	14.3	6348
			CP 70-370				
Sept. 1	Check	30.4	26.4	2.3	16.2	13.1	5606
	Cover	36.7	32.9	2.5	16.4	13.5	6966
Oct. 1	Check	26.7	24.3	1.9	16.6	13.4	5050
	Cover	27.6	26.8	2.2	16.0	12.9	5002
Nov. 1	Check	12.8	15.1	1.9	15.5	12.3	2192
	Cover	21.7	15.3	2.1	15.9	12.6	3815
HSD .05		5.4	5.4	0.6		1.9	1446
			Mean cover effect				
	Check	25.0	22.7	2.1	16.4	13.3	4720
	Cover	30.0	24.9	2.2	16.6	13.5	5748
HSD .05		1.3	1.3	NS		NS	337

The cane stubble was protected from freeze damage by covering it with soil prior to a freeze in late November, 1983. The soil cover was removed in early spring and stubble crop was harvested in November, 1984.

Table 12. Effect of stubble protection after harvesting sugarcane planted by four planting methods on the yield of the subsequent stubble crop on the St. Gabriel Research Station, 1984.

Drill width	Stubble protection treatment	Cane yield	Stalk		Normal juice		Sugar yield
			No.	Wt.	Brix	Sucrose	
in.		T/A	1000/lbs.	lbs.	%	%	lbs./A
V	Check	27.8	20.4	2.35	16.5	13.2	5150
	Cover	31.8	22.0	2.37	16.5	12.7	5649
18	Check	28.7	18.4	2.29	16.6	13.1	5298
	Cover	32.7	22.5	2.20	17.1	13.7	6359
24	Check	24.0	19.8	2.22	16.8	13.2	4458
	Cover	29.8	23.9	2.34	16.8	13.4	5656
36	Check	26.8	20.9	2.22	16.7	13.4	5057
	Cover	32.9	21.8	2.30	16.6	13.2	6098
HSD .05		3.6	NS	NS		0.8	787
	Check	26.8	19.8	2.27	16.7	13.2	4991
	Cover	31.9	22.5	1.30	16.8	13.2	5940
HSD .05		1.1	2.3	NS		NS	240

The cane stubble of varieties CP 65-357 and CP 72-370 were protected from freeze damage after harvesting by covering it with soil prior to a freeze in 1983. The soil cover was removed in early spring and the stubble crop was harvested in November, 1984. The data are an average of the two varieties.

Sugarcane Breeding[1/]

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Agronomy Department

The LSU sugarcane breeding project is part of the LSU Sugarcane Varietal Improvement program. The production of true seed, the selection of agronomically superior clones and the assignment of permanent "L" variety numbers are responsibilities of the Agronomy Department to the Variety Improvement Program. Research to improve our skills in sugarcane breeding and to expand our knowledge of sugarcane genetics and is conducted under the auspicies of projects La. 730 and H2413. Many of the specific studies are carried out by and are used to train graduate students. [2/]

The scope of the Variety Improvement Program dictates that many people must work together if we are to be successful. Most of the research is conducted on the St. Gabriel Research Station. The support for this program by Charles Richardson, Resident Director, is appreciated. Personnel who contributed to this program in 1983 included: Joey Quebedeaux was responsible for photoperiod treatments and crossing. Keith Bischoff was responsible for selection (seedling production through assignment). Dr. Mike Giamalva was responsible for infield testing and Eugene LeBlanc was responsible for outfield testing. Herman Landry was responsible for farming activities at St. Gabriel and Edwis Dufrene was responsible for the laboratory sucrose analyses. Jack Berg and Barbara Gustavson were responsible for data management. Lin Yangquan and Dong-huo Zeng of the People's Republic of China assisted in all phases of the program.

The involvement of colleagues in other disciplines in the characterization of potential parents and the evaluation of resulting progenies is acknowledged. Dr. T. E. Reagan and Jeff Flynn of Entomology performed the evaluations for resistance to the sugarcane borer. Dr. Jeff Hoy and Lori Grelen of Plant Pathology and Crop Physiology performed the evaluations for resistance to sugarcane mosaic virus and smut. Certainly, these cooperative efforts greatly improve the effectiveness of the LSU sugarcane variety improvement program.

Crossing:

One hundred forty-nine varieties of sugarcane were used in the 1984 crossing campaign. There were 17 "L" varieties, 44 "LCP" varieties, 63 "CP" varieties selected for Louisiana, 18 "CP" varieties selected for Florida, 5 "US" varieties, 1 "CB" variety and 1 "CO" variety. Ninety-seven varieties were of known photoperiod response and 52 were of unknown response.

The 52 varieties of unknown photoperiod response along with 31 selected varieties of known photoperiod response were placed on the greenhouse rail system for natural induction. By comparing the date of flowering of these newer varieties to the date of flowering of the older varieties a first

1/Complete details of the 1984 breeding program are contained in the "Sugarcane Breeding Office Report".

2/The financial support of the American Sugar Cane League in training graduate students is gratefully acknowledged.

approximation of the photoperiod response of the new varieties can be made. The pollen producing capacity of each new variety that flowers following natural induction is also estimated. All experimental crosses produced with those new varieties are also available for the variety selection phase of the program.

The 97 varieties of known photoperiod response were placed in one of six photoperiod bays (categories) according to their ease of photoperiod flower induction. The number of varieties in each category from the most difficult to the easiest to induce were 34, 14, 13, 15, 16 and 5, respectively.

Only sunlight was used as the light source for the 1984 photoperiod treatments. At a prescribed time to achieve the desired photoperiod, the door of the photoperiod bay was opened and the carts were pulled from the photoperiod house. At the end of the day, natural sunset was used to terminate the photoperiod for each day of treatment. The carts were pushed into the photoperiod house after sunset. From the most difficult category to the easiest, the number of constant photoperiods (induction cycles) were 45, 38, 31, 24, 17, and 14 days of 12 hours 30 minutes. The constant photoperiod for each category was programmed to be completed on July 16.

The decreasing of the photoperiod for all bays commenced on July 16. There was a progression in the rate of decreasing photoperiod until August 15 after which the rate of decrease was held at 1 minute per day until September 11. At that time all bays were again subjected to natural photoperiod. All plants programmed for pollen production were protected when the night temperature fell below 70°F.

All stalks on the photoperiod system were air layered during the week of August 27. The first cross was made on September 11. The tasseling on the photoperiod system peaked during the period of September 17 through September 28. The synchronization of tasseling was excellent, and for all practical purposes the flowering on the photoperiod carts was completed by mid-October.

The first cross from the greenhouse rail system was made on November 19. Flowering of the material on this system continued until the end of December. At the end of the crossing campaign all varieties that had not flowered were dissected to determine if indeed they had been induced. Of the 52 new varieties 11 were classified as easy flowering, 15 moderately easy, 6 intermediate, 9 moderately hard, and 11 as hard to induce.

Three hundred ten crosses were made with the material induced to flower via controlled photoperiod. Ninety-four crosses were made with the material from the greenhouse rail system.

There were two periods during the crossing campaign when the relative humidity could not be raised to a satisfactory level. The viability of the seed produced during these periods was extremely low. In spite of these difficulties, over 269,000 viable seed were produced during the 1984 L crossing campaign.

Agronomic Selection:

A summary of the agronomic selections and advancements accomplished during 1984 by the LSU sugarcane breeding program is presented in Table 1. Eighty thousand seedlings of 194 crosses from the 1983 crossing series were potted in the winter of 1984. Sixty-eight thousand were from the LSU crossing program and 11,008 were from the USDA basic crossing program. Of the 67,167 set to the field in April, 54,756 survived the transplanting operation.

Of the 66,651 seedlings of the 1982 crossing series set to the field in 1983, 25,357 overwintered and were available for selection in 1984. The severe freezes of December 1983 took a heavy toll of our single stools. During the first two weeks of September, 3,397 or 13.4% of the varieties in stubble single stools were advanced to 1st line trials. The varieties that were advanced met minimum standards for growth habit, stalk diameter, stalk height, stalk number, soluble solids content (by hand refractometer), and absence of pith.

Nine hundred thirty-eight varieties (18.6%) of the 5,029 in first line trials of the 1981 crossing series were advanced to second line trials in October. These varieties met or exceeded minimum standards for growth habit, stalk diameter, stalk height, stalk number, soluble solids content (by hand refractometer), and absence of pith. During the month of November, the first line trial plots of these varieties were sampled and data was taken on mean stalk weight and sucrose via a mill extraction.

Eight hundred twenty-nine varieties in plant cane second line trials of the 1980 crossing series were rated and evaluated for agronomic traits. Three hundred fifty four varieties were replanted in seed increase plots and will be considered for assignment in 1985. The plant cane second line trial plot and the stubble first line trial plot of each of those experimental varieties was sampled and data on the mean stalk weight and sucrose (via mill extraction) was taken.

Seventy-two experimental varieties of the 1979 crossing series were assigned permanent numbers in October, 1984. An additional 21 were assigned numbers in December, 1984. Of the 93 total assignments, 67 were derived from L crosses and assigned "L" numbers. Twenty-six were derived from USDA crosses and assigned "LCP" numbers. A chip-press fiber analysis was performed on the 1984 assignments.

Advancement of Experimental Varieties:

At the variety advancement committee meeting of August, 1984, it was decided that 65 L, LCP, and CP experimental varieties of the 1979 through 1982 assignment series would be replanted and continued in active testing. There remains one L of the 1980 assignment series, 8 L's of the 1981 assignment series, and 24 L's of the 1982 assignment series. As part of the routine variety exchange, a total of 62 L's and LCP's of the 1983 L assignment series were sent to the U.S. Sugarcane Field Laboratory in the fall of 1984.

Graduate Student Projects:

There are several graduate student projects underway in the LSU variety improvement program. While the projects are used to help train graduate students, the results of the projects help in improving the efficiency of the program.

Joey Quebedeaux is evaluating a proposed method to accelerate the prediction of stubbling ability in sugarcane.

Edwis Dufrene is evaluating a method of predicting the adaptability of experimental varieties to mechanical harvesting.

Tony Lourens is studying the genetic stability of somaclonal variants associated with tissue culture propagated sugarcane.

Keith Bischoff is studying the response of basic Saccharum species to chemical tillering agents and the inheritance of that reaction in certain breeding lines.

Imran Mohammad is studying the inheritance of flowering response in sugarcane. Because sugarcane does not flower naturally in Louisiana, he is conducting this research at the USDA Sugarcane Field Station in Canal Point, Florida.

*Scott Milligan is studying the detection of and inheritance of stability of yield components in sugarcane.

*Holder of an LSU Alumni Fellowship.

Table 1. Summary of selections and advancements processed during 1984 by the LSU sugarcane breeding program.

Crossing series	Number of crosses	Seedlings potted	Seedlings to field	Survived trans-planting	Available for selection	Advanced to		Assigned in 1984
						First lines	Second lines	
79	84		45,421		25,790	2,434	684	93[1/], [2/]
80	135		73,860	60,891	47,944	8,353	829	
81	150	76,766	68,756	62,803	48,628	5,029	938[1/]	
82	99	76,928	66,651	45,714	25,357	3,397[1/]		
83	194	80,000	67,167[1/]	54,756[1/]				

1/Work completed in 1984.

2/Of the 93 assignments in the 1979 crossing series, 67 are L's and 26 are LCP's.

INFIELD VARIETY TRIALS

Dr. Mike J. Giamalva
Sugar Station

Infield variety trials are conducted at St. Gabriel on varieties from the date they are assigned a permanent number until they are planted in replicated trials in the outfield testing program. These trials are planted at St. Gabriel on a Sandy commerce soil next to the Mississippi river and on Sharky clay soil across the railroad tracks at St. Gabriel. Two replications are planted on each soil type in three row plots when seed is available otherwise two replications are planted on sandy soil and one observation plot on clay soil. A small seed plot is also planted on the ends and outside rows.

The first year after assignment and reselection the varieties selected at St. Gabriel are sent to Houma, La. and those selected at Houma are sent to St. Gabriel. From this point onward evaluations are made on all selections made in Louisiana at both locations. These are compared to standard varieties. These are compared to standard varieties planted in each test.

Twice per year in late May and August all stubble plots are evaluated by the entire selection team from L.S.U., the U.S.D.A. and the American Sugar Cane League.

All plots are harvested by machine and yields are recorded. A 10-stalk sample is sent to the laboratory at St. Gabriel for juice analysis. All data is transposed to computer sheets for statistical analysis.

Each year after the evaluation in August, the variety advancement committee, made up of members of the 3 organizations, meet to decide which varieties will be replanted.

After these evaluations and after the first stubble crop, a larger seed plot is planted to supply seed for outfield testing and seed increase at the primary stations.

The winter of 1983-84 was one of the most severe on record. Temperatures remained below freezing for sixty-nine hours at St. Gabriel and the soil was frozen to a depth of 3 inches for fifty-two hours continuous. In spite of this extreme weather yields at St. Gabriel were very high in the infield plots.

RESULTS OF INFIELD VARIETY TESTS AT THE ST. GABRIEL FARM DURING 1984

In Tables 1 and 2 are shown results from the 1979 series. In this test there were 4 CP varieties, CP 79-300, CP 79-318, CP 79-332, and CP 79-348 along with CP 65-357, CP 70-321 and CP 74-383. In second stubble all other varieties produced higher yields than CP 65-357. In first stubble CP 79-300, which was equal to CP 74-383 was superior to all other varieties.

In Tables 3, 4 and 7 are given data from the 1980 series. In this series there are 1-L variety and 3 CP varieties. These were planted on both light and heavy soils. Data shows that in second stubble L 80-35 was inferior to CP 65-357 and CP 72-356. In first stubble the data shows that there were no differences among the varieties tested except for CP 65-357 which was lower.

Yields of varieties in the 1981 series are shown in Tables 5 - 8. In these 4 tests are shown data from second stubble of the L 1981 series, first stubble of both L and CP series on light soil and plant-cane of both series on both light and heavy soil. This data was very erratic. There were no distinct mean separations, therefore it would be very difficult to discard many from this series from this data in 1984.

In Tables 9 -11 are shown yields obtained from the 1982 series. Yields in this series appear to be very high and once again very difficult to evaluate. These data alone could not be used to eliminate many varieties.

In 1983 series data is given in table 12. These data are from 1 introductory plot. Observations were also recorded from the seed plot.

All of these plots will be evaluated for stand stooling ability by the entire team. Unfortunately many of these will be discarded due to sparce stand which was caused by the severe winter of 1984-85.

Some of the data given, where yields were exceptionally high were harvested late in the season when the rains came. These data were recorded without a deduction for trash.

CP 76-331 was released for commercial production in 1984. All varieties from the 1977 and 1978 series were discarded.

All of the varieties shown in the 12 tables were replanted along with varieties from the 1984 series. After evaluation of all the data and 2 field observations by the entire team decisions will be made as to which varieties will be replanted in 1985.

Table 1. Yields 1/ recorded from the 1979 series second stubble at St. Gabriel during 1984.

Variety	Stalk weight in pounds	Tons per acre	Sugar per ton TRS	Sugar per acre
CP 79-300	2.35	36.9	223	8220 a
CP 72-356	2.17	33.2	246	8150 a
CP 79-332	2.19	29.9	249	7416 a
CP 79-318	1.93	29.8	235	6996 a
CP 70-321	2.27	27.8	255	7089 a
CP 79-348	2.17	27.7	244	6717 a
CP 65-357	2.07	16.1	256	4187 b

Means with the same letter are not significantly different.
1/ mean of 2 replications
Planting date: 09/10/81
Harvest date: 10/29/84
Plot size: 3 rows, 18 ft. long

Table 2. Yields 1/ recorded from the 1979 series first stubble at St. Gabriel during 1984.

Variety	Stalk weight in pounds	Tons per acre	Sugar per ton TRS	Sugar per acre
CP 79-300	2.56	41.3	250	10308 a
CP 74-383	2.39	37.5	260	9735 ab
CP 79-332	1.93	34.2	268	9147 bc
CP 79-348	2.46	31.4	271	8501 c
CP 70-321	2.37	30.2	273	8168 cd
CP 79-318	2.14	27.4	267	7314 d
CP 65-357	2.40	25.4	281	7152 d

Means with the same letter are not significantly different.
1/ Mean of 3 replications.
Planting date: 09/02/82
Harvest date: 11/12/84
Plot size: 3 rows, 16 ft long

Table 3. Yields 1/ recorded from the L-1980 series second stubble at St. Gabriel during 1984.

Variety	Stalk weight in pounds	Tons per acre	Sugar per ton TRS	Sugar per acre
CP 72-356	2.19	36.3 a	254 a	9195 a
CP 65-357	2.00	28.2 b	237 a	6670 b
L 80-35	2.26	24.4 b	230 a	5581 bc
CP 48-103	2.12	20.8 b	232 a	4831 c

Means with the same letter are not significantly different.
1/ means of 2 replications.
Planting date: 09/24/81
Harvest date: 10/30/84
Plot size: 3 rows, 18 ft long

Table 4. Yields 1/ recorded from the 1980 series first stubble on light soil at St. Gabriel during 1984.

Variety	Stalk weight in pounds	Tons per acre	Sugar per ton TRS	Sugar per acre
CP 74-383	2.17	33.7	246	8292 a
CP 80-324	2.55	31.8	252	8025 a
CP 80-323	2.87	31.3	261	8150 a
CP 70-321	2.37	28.8	257	7394 ab
CP 80-356	2.95	28.5	264	7521 ab
L 80-35	2.36	26.8	241	6480 ab
CP 65-357	2.06	23.8	249	5934 b

Means with the same letter are not significantly different.
1/ Mean of 2 replications.
Planting date: 09/28/82
Harvest date: 10/30/84
Plot size: 3 rows, 18 ft long

Table 5. Yields 1/ recorded from the L-1981 series second stubble on light soil at St. Gabriel during 1984.

Variety	Stalk weight in pounds	Tons per acre	Sugar per ton TRS	Sugar per acre TRS
LCP 81-30	2.22	30.6	289	8819 ab
LCP 81-20	2.22	26.4	261	6894 bcd
CP 65-357	1.67	23.6	256	6010 cd
CP 61-37	2.08	36.2	249	8982 abcd
LCP 81-26	2.17	30.2	239	7201 bc
LCP 81-10	2.64	39.2	236	9251 a
L 81-1	2.02	28.1	235	6592 bcd
LCP 81-12	2.15	33.8	229	5866 d
LCP 81-23	1.65	28.2	208	7737 bc
LCP 81-9	1.63	28.6	207	5518 de

1/ Average of 2 replications
Planting date: 10/16/81
Harvest date: 11/08/84
Plot size: 3 rows, 18 ft long

Table 6. Yields [1/] recorded from the L-1981 series Plant cane on light soil at St. Gabriel during 1984 based on plot weight.

Variety	Stalk weight in pounds	Tons per acre	Sugar per ton	Sugar per acre TRS
LCP 81-10	3.83	63.6 a	231 abcde	14633 a
CP 70-321	3.35	52.8 b	259 ab	13677 ab **
CP 74-383	3.15	52.7 b	198 ef	10450 cdefgh
CP 81-325	3.72	49.9 bc	252 abc	12536 abc
CP 81-26	3.82	48.8 bc	238 abcde	11569 bcdef
CP 81-9	2.79	48.7	216 cdef	10556 cdefgh
CP 81-335	2.89	48.1 bc	220 bcdef	10591 cdefgh
LCP 81-23	3.12	48.0 bc	199 def	9556 cdefgh
CP 81-328	2.64	47.7 bcd	245 abc	11706 bcde
CP 81-329	3.65	46.9 bcde	236 abcde	11086 bcdef
LCP 81-30	3.33	45.7 bcdef	262 a	11952 abcd
CP 81-312	3.16	45.5 bcdef	240 abcd	10904 bcdefgh
LCP 81-12	3.48	45.2 bcdef	190 f	8565 fgh*
CP 65-357	2.95	44.4 bcdef	223 abcdef	9982 bcdefgh
CP 81-338	4.01	43.8 bcdef	224 abcdef	9786 cdefgh
LCP 81-5	3.41	42.6 bcdefg	226 abcdef	9640 cdefgh
LCP 81-16	3.43	41.5 bcdefg	230 abcde	9556 cdefgh
L 81-1	3.00	41.1 bcdefg	221 bcdef	9051 defgh*
CP 81-332	2.77	40.4 cdefg	226 abcdef	9131 defgh*
LCP 81-3	2.72	40.0 cdefg	228 abcdef	9096 defgh*
CP 81-304	2.89	39.7 cdefg	259 ab	10279 cdefgh
LCP 81-28	2.99	39.5 cdefg	230 abcde	9100 defgh*
LCP 81-15	3.18	38.9 cdefg	212 cdef	8221 gh*
LCP 81-20	3.89	38.3 cdefg	227 abcdef	8683 efgh*
CP 81-341	2.59	36.3 defg	228 abcdef	8262 gh*
LCP 81-27	3.16	35.9 efg	243 abc	8569 fgh*
CP 81-316	3.67	34.9 fg	236 abcde	8226 gh*
CP 81-311	3.13	32.1 g	243 abc	7857 h*

Means with the same letter are not significantly different
1/ means of 3 replications.
Planting date: 09/26/83
Harvest date: 11/15/84
** Exceed CP 65-357 in sugar per ton.
* Yields less than CP 65-357
None yields equal to CP 65-357.

Table 7. Yields [1/] recorded from the 1980 and 1981 first stubble on heavy soil at St. Gabriel during 1984.

Variety	Average stalk weight in pounds	Tons per acre	Sugar per ton TRS	Sugar per acre TRS
CP 80-324	2.42	43.2	239	10298
CP 70-330	2.95	41.9	245	10208
LCP 81-30	2.63	42.1	241	10137
CP 74-383	2.38	42.7	226	9635
CP 80-323	2.75	41.3	232	9570
CP 70-321	2.50	38.3	246	9436
CP 80-356	2.96	36.2	242	8753
LCP 80-35	2.87	37.5	229	8571
LCP 81-10	2.62	32.5	257	8335
LCP 81-26	2.80	39.8	208	8269
LCP 81-9	2.15	38.6	191	7377
L 81-1	2.54	29.9	237	7020
LCP 81-23	2.52	38.9	232	7010
CP 65-357	2.21	24.3	219	5335

1/ Mean of 2 replications
Planting date: 09/28/82
Harvest date: 11/20/84
Plot size: 3 rows, 16 ft long

Table 8. Yields [1/] recorded from the L-1981 series plant cane on heavy soil at St. Gabriel during 1984.

Variety	Stalk weight	Tons per acre	Sugar per ton TRS	Sugar per acre TRS
CP 81-335	2.52	52.0	200	10364
CP 84-383	3.34	51.4	216	11027
LCP 81-26	3.20	48.2	171	8226
LCP 81-10	3.16	46.9	212	9991
L 81-1	3.46	46.4	225	10405
LCP 81-12	3.10	45.9	166	7619
LCP 81-9	3.47	45.9	203	9334
LCP 81-28	3.09	45.9	175	7975
CP 81-329	3.60	45.0	222	10021
LCP 81-15	3.17	44.1	191	8503
CP 70-330	3.48	43.3	223	9632
CP 65-357	2.40	42.8	217	9288
LCP 81-5	3.06	42.8	220	9399
CP 70-321	3.00	42.8	242	10428
CP 81-304	2.92	42.6	239	10200
LCP 81-30	3.29	42.3	244	10304
LCP 81-3	2.57	41.6	218	9050
LCP 81-27	3.48	40.8	230	9345
LCP 81-23	3.00	40.2	200	8067
LCP 81-16	3.27	39.9	216	8624
LCP 81-20	3.27	38.8	206	7960

Planting date: 09/27/83
Harvest date: 11/12/84
Plot size: 3 rows, 18 ft long

Table 9. Yields recorded from the 1982 series first stubble on sandy soil at St. Gabriel during 1984.

Variety	Stalk weight in pounds	Tons per acre	Sugar per ton TRS	Sugar per acre TRS
LCP 82-47	3.12	70.2	277	19452
L 82-40	2.68	63.3	279	17654
LCP 82-97	3.08	71.4	228	16293
LCP 82-45	2.63	61.0	264	16122
L 82-110	2.80	52.8	276	14583
LCP 82-89	2.03	48.0	282	13536
LCP 82-73	2.68	46.9	288	13484
CP 74-383	2.55	46.8	266	12494
LCP 82-76	2.29	43.2	274	11828
LCP 82-53	2.77	49.1	237	11656
LCP 82-57	2.52	38.4	291	11178
LCP 82-71	2.61	35.6	295	10506
LCP 82-46	2.13	44.1	238	10496
LCP 82-33	2.57	42.1	249	10474
CP 70-321	2.37	35.0	288	10094
LCP 82-58	2.31	41.5	240	9952
LCP 82-74	2.18	37.2	245	9103
LCP 82-85	2.07	35.8	234	8366
LCP 82-39	1.70	39.4	209	8246
CP 65-357	2.14	30.2	266	8045
LCP 82-86	2.44	31.1	256	7971
LCP 82-61	2.29	34.4	227	7809
LCP 82-96	2.29	32.3	237	7668
LCP 82-94	2.51	29.1	261	7592
LCP 82-63	1.79	25.2	233	5862
LCP 82-95	1.95	20.4	234	4767

Calculated from stalk weights and numbers from one single plot.
Planting date: 10/20/83
Harvest date: 11/20/84
Plot size: 3 rows, 16 ft long

Table 10. Yields [1/] recorded from the 1982 series plant cane in sandy soil at St. Gabriel during 1984.

Variety	Stalk weight in pounds	% Fiber	Tons per acre	Sugar per ton TRS	Sugar per acre TRS
L 82-40	2.95	10.2	56.2	257	14430
LCP 82-47	2.86	13.3	48.6	277	13452
L 82-110	3.12	9.8	57.2	230	13132
CP 74-383	2.74	13.5	54.0	242	13061
LCP 82-97	2.97	14.1	54.5	239	12994
LCP 82-73	3.58	13.0	52.5	248	12987
LCP 82-95	2.91	12.5	57.5	225	12967
LCP 82-71	3.29	10.6	50.7	251	12730
LCP 82-36	3.41		49.8	252	12513
CP 70-321	3.12	12.8	49.9	247	12345
LCP 82-109	3.21		55.9	219	12218
LCP 82-94	2.74	13.1	49.5	243	12049
LCP 82-74	2.94	15.1	49.1	244	11986
LCP 82-33	3.18	14.8	52.4	227	11878
LCP 82-34	2.85		41.8	282	11791
LCP 82-63	2.75	13.0	45.1	258	11720
LCP 82-46	2.88	11.9	51.0	226	11524
LCP 82-66	2.79		44.9	257	11439
LCP 82-89	2.74	12.6	49.9	228	11340
LCP 82-86	2.65	13.7	47.8	235	11212
LCP 82-49	3.32		44.9	247	11096
LCP 82-44	2.82		46.8	233	10892
LCP 82-57	2.84	11.5	50.8	214	10791
LCP 82-61	2.79	12.2	44.7	241	10781
LCP 82-85	2.93	10.8	48.1	219	10540
LCP 82-96	3.01	12.2	45.5	227	10317
LCP 82-45	3.36	13.8	47.0	215	10107
LCP 82-76	2.77	13.8	44.9	224	10027
LCP 82-35	3.16		45.0	224	9999
LCP 82-53	2.68	14.7	43.2	228	9904
LCP 82-64	2.76	12.8	41.6	236	9748
LCP 82-43	2.42		42.5	229	9719
LCP 82-58	2.36	11.6	39.6	245	9696
LCP 82-91	3.05		36.6	261	9591
LCP 82-92	2.19		33.7	279	9361
CP 65-357	2.54	14.1	36.2	251	9075
LCP 82-39	2.83	13.4	47.6	190	9024
LCP 82-107	3.23		40.4	224	9023
LCP 82-112	3.01		37.7	231	8537
LCP 82-56	2.64		34.5	245	8439
LCP 82-77	3.23		33.4	231	7793
LCP 82-42	3.19		36.7	206	7574
LCP 82-83	2.56		24.3	260	6396

1/ Average of 2 replications.
Calculated from weighed plots.
Planting date: 09/26/83
Harvest date: 11/27/84
Plot size: 3 rows, 16 ft long

Table 11. Yields 1/ recorded from the 1982 series plant cane on heavy soil at St. Gabriel during 1984.

Variety	Tons per acre	Sugar per ton TRS	Sugar per acre TRS
LCP 82-47	67.1	246	16505
LCP 82-73	56.8	216	12282
LCP 82-63	52.6	235	12261
LCP 82-61	53.9	222	11960
LCP 82-71	57.3	204	11757
LCP 82-39	58.5	200	11594
CP 70-321	52.5	218	11573
LCP 82-56	48.3	237	11382
CP 70-330	52.6	206	11048
LCP 82-36	58.0	192	10906
LCP 82-112	55.3	194	10826
LCP 82-46	55.6	195	10823
CP 74-383	52.2	205	10670
LCP 82-53	51.6	204	10517
LCP 82-34	41.9	250	10498
LCP 82-89	47.6	220	10243
LCP 82-76	50.2	205	10163
L 82-100	57.3	178	10118
LCP 82-92	40.8	243	9908
LCP 82-33	50.9	191	9727
LCP 82-85	53.2	181	9629
LCP 82-109	47.9	201	9627
LCP 82-74	48.9	191	9539
LCP 82-44	44.2	212	9365
LCP 82-58	49.3	189	9292
LCP 82-49	50.2	188	9267
LCP 82-94	43.9	208	9102
LCP 82-35	48.0	189	9091
L L 82-40	43.1	216	9016
LCP 82-95	49.5	177	8749
LCP 82-83	42.8	206	8708
LCP 82-45	44.2	197	8651
LCP 82-77	35.1	223	7779
LCP 82-86	40.8	188	7744
LCP 82-107	39.8	184	7681
LCP 82-91	33.4	222	7428
LCP 82-42	35.0	206	7166
LCP 82-66	36.6	193	6422
LCP 82-57	38.9	149	5693
LCP 82-43	32.0	171	5458
CP 65-357	25.9	186	4609

1/ Average of 2 replications.
Planting date: 10/04/83
Harvest date: 11/20/84
Plot size: 3 rows, 16 ft long

Table 12. Yields recorded from the 1983 series plant cane at St. Gabriel during 1984.

Variety	Stalk weight in pounds	% Fiber	Tons per acre	TRS per ton	TRS per acre
CP 65-357	2.84	12.3	33.6	234	7876
CP 70-321	2.66	11.4	33.3	213	7123
LCP 83-114	2.41	12.2	31.8	222	7044
LCP 83-115	2.69	15.4	41.6	236	9809
LCP 83-117	3.42	13.0	34.2	217	7421
LCP 83-119	3.46	12.6	51.1	176	9009
LCP 83-120	2.44	12.5	39.4	212	8357
LCP 83-121	2.23	13.8			
LCP 83-122	2.43	13.0	40.9	216	8822
LCP 83-123	2.57	14.1	26.9	204	5474
LCP 83-124	2.44	17.1	32.7	217	7083
LCP 83-125	3.05	10.1	47.8	242	11553
LCP 83-126	2.94	11.3	40.1	232	9311
LCP 83-127	3.50	12.9	34.2	234	8016
LCP 83-128	2.36	10.9	27.9	209	5839
LCP 83-129	2.63	13.7	28.1	220	6207
LCP 83-131	2.86	14.3	45.5	220	9996
LCP 83-133	3.44	12.0	51.6	215	11068
LCP 83-134	2.62	12.7	50.6	218	11041
LCP 83-135	3.41	13.4	34.1	264	9016
LCP 83-136	1.93	12.0	41.7	216	8595
LCP 83-137	2.47	11.8	50.0	210	10495
LCP 83-138	2.94	10.0	48.8	232	11331
LCP 83-140	2.62	14.8	49.4	216	10656
LCP 83-141	2.82	11.9	41.0	216	8836
L 83-144	2.65	10.8	30.1	204	6143
L 83-145	2.51	15.1	37.7	230	8652
LCP 83-146	3.53	11.8	40.9	233	9509
LCP 83-147	2.70	12.8	14.1	199	2806
LCP 83-149	2.69	11.4	33.0	263	8663
LCP 83-151	2.70	11.0	44.8	273	12208
LCP 83-152	2.92	13.3	27.9	203	5653
LCP 83-153	2.35	11.1	34.7	239	8300
LCP 83-154	1.93	11.9	32.5	258	8382
LCP 83-155	3.33		40.1	223	8530
LCP 83-157	2.68	11.8	29.8	235	7000
LCP 83-158	2.72	12.3	38.3	238	9104
LCP 83-159	2.78	12.0	38.5	267	10272
LCP 83-160	3.49	11.9	49.2	255	12521
LCP 83-161	3.14	12.2	32.1	213	6844
LCP 83-162	2.27	12.4	37.7	228	8584
LCP 83-163	3.67	13.2	48.3	246	11921
LCP 83-164	2.16	13.0	36.8	251	9244
LCP 83-165	2.53	14.1	43.7	242	10575
LCP 83-168	3.02	12.5	48.0	237	11366
LCP 83-169	2.49	13.8	52.6	246	12924
LCP 83-172	3.51	12.9	38.3	203	7786
LCP 83-173	2.61	12.7	32.0	227	7258
L 83-175	2.73	10.1	37.2	219	8139

L 83-177	2.31	12.5	32.0	258	8243
LCP 83-178	2.02	12.9	28.9	223	6450
LCP 83-179	2.53	14.4	44.9	221	9918
LCP 83-180	3.08	13.2	45.5	201	9159
L 83-181	2.86	14.4	48.8	245	11961
LCP 83-182	2.62	14.3	32.8	262	8584
L 83-183	2.92	13.5	41.1	236	9695
LCP 83-184	2.37		37.7	223	8422
L 83-186	3.19	12.1	37.0	207	7663
LCP 83-189	2.05	12.4	35.4	233	8252
LCP 83-191	4.09	10.0	34.4	235	8094
L 83-193	3.49	12.7	52.4	210	10999
L 83-194	3.39	14.7	49.3	203	10003
L 83-196	2.26	12.2	39.6	205	8118
LCP 83-198	3.10	12.7	37.3	206	7691

Planting date: 10/17/83
Harvest date: 11/27/84
Plot size: 3 rows, 16 ft long

RESULTS OF OUTFIELD TEST HARVESTED IN 1984

Eugene J. LeBlanc
Sugar Station

Results given in this report are obtained for all outfield test plots. This research is conducted in cooperation with the U.S. Department of Agriculture and the American Sugar Cane League. Personnel directly involved and responsible for obtaining data presented are Eugene LeBlanc from the Louisiana Agricultural Experiment Station, Dr. Charles Richard and Windell Jackson from the American Sugar Cane League and Donnie Garrison from the U. S. D. A. at Houma, Louisiana. Special thanks are due to many others including cooperating farmers and other members of the U. S. D. A. who are not named but played a significant part in all phases of the research.

ANNUAL REPORT - 1984

Outfield Variety Test - Louisiana

INTRODUCTION

During 1984 thirty-one replicated tests were harvested at twelve outfield locations. Twenty-two of the tests were on light soils and nine were on heavy soils. Outfield tests were harvested under fair weather conditions. Both one-row and two-row harvesters were used to harvest outfield tests and they both performed well in harvesting all varieties erect or lodged.

The data for this report were obtained through the cooperation of personnel of the United States Department of Agriculture, Louisiana Agricultural Experiment Station and the American Sugar Cane League. The testing program would not be possible without full cooperation from the growers at each outfield location.

New Locations

Two new outfield tests were planted in 1984 on heavy soils at Frank Pierce and Sons (Maringouin) and at Oaklawn Plantation (Franklin). This will strengthen the testing program on heavy soils as it provides a total of six heavy soil and eight light soil locations.

Test Data

The data obtained in 1984 for sugar per acre, tons of cane per acre and sugar per ton of cane in plant cane, first stubble and second stubble at eight light and four heavy soil locations are presented in Tables 1 through 18.

In these tables, averages of the varieties for all locations are shown in the right-hand column. Yields significantly higher or lower than the standard variety, CP 65-357 are indicated for each location by (+) or (-), respectively.

Combined results of plant cane, first and second stubble tests, at all locations for stalk weight and stalk population are shown in Table 19, 20, and 21.

Unreleased Varieties

Light Soils

An average of light-soil locations show that CP 79-300 and CP 79-318 were higher than CP 65-357 in sugar per acre in plant cane, while CP 79-332 and CP 79-348 were lower and not significantly different respectively, than CP 65-357 in plant cane (Table 1).

Heavy Soils

An average of heavy-soil locations show that CP 79-300, CP 79-318, and CP 79-348 were higher in sugar per acre than CP 65-357. There was no significant difference between CP 79-332 and CP 65-357 in plant cane (Table 10).

Kleen Tek

CP 65-357 KT was harvested at five light soil locations and one heavy-soil location. An average of all five locations show that CP 65-357 KT was higher in sugar per acre than CP 65-357 on light soil (Table 1).

Commercial Varieties

Light Soils

CP 76-331 was significantly higher than CP 65-357 in sugar per acre in plant cane (Table 1). In first stubble CP 70-321, CP 72-356, CP 72-370, CP 74-383 and CP 76-331 were all significantly higher than CP 65-357 in sugar per acre (Table 4). CP 70-321, CP 72-356, CP 74-383, and CP 76-331 were all significantly higher than CP 65-357 in sugar per acre in second stubble (Table 7).

Heavy Soils

There was no significant difference between varieties in plant cane in sugar per acre. In first stubble CP 70-321, and CP 74-383 were significantly higher than CP 65-357 in sugar per acre (Table 13). CP 72-356, CP 72-370, and CP 74-383 were all significantly higher in second stubble in sugar per acre than CP 65-357 (Table 16). (D. Garrison, C. Richard, W. Jackson, and E. LeBlanc).

Table 1. Results of plant cane variety tests on light soil at 8 locations during 1984.

Variety	Yield of sugar per acre (pounds)								
	Bon Secour	Cinclare	Georgia	Glenwood	Lanaux	Oaklawn	R. Hebert	St. John	Avg.
CP 76-331	7439	6657	7101	8146	8574	6763	5046	6569	+7049
CP 79-318	7716	6402	7229	7054	8536	5919	4668	+8015	6943
CP 74-383	6335	6480	6915	7169	7555	6141	5817	6668	6635
CP 70-321	7299	5631	5724	5692	7089	6674	5837	+7482	6429
CP 65-357	6512	4923	5188	6310	7314	7115	5973	6348	6204
CP 79-348	5868	5256	5621	5404	8431	6264	6255	6070	6146
CP 79-332	7647	5407	5417	6459	6233	6114	4368	6644	6036
CP 72-356	6567	5143	5758	5876	6748	5209	5233	6628	5896
CP 72-370	7202	4991	5959	7188	7218	5295	4238	-5309	5870
CP 79-300	6342	6800	6615	7336	8129	--	--	--	--
CP 65-357 KT	6978	4122	--	7507	7198	--	--	5934	--
HSD .05	NS	NS	NS	NS	NS	NS	NS	709	802
Date Harvested	11/20	11/26	12/03	12/04	12/10	11/28	11/27	11/29	

(+) Denotes significantly higher value than standard variety CP 65-357 at the 5% level of probability.

(-) Denotes significantly lower value than standard variety CP 65-357 at the 5% level of probability.

Table 2. Results of plant cane variety tests on light soil at 8 locations during 1984.

Variety	Yield of cane per acre (tons)								
	Bon Secour	Cinclare	Georgia	Glenwood	Lanaux	Oaklawn	R. Hebert	St. John	Avg.
CP 74-383	+35.7	26.9	+30.4	36.9	33.6	27.7	23.9	31.1	+30.8
CP 76-331	32.9	25.8	+29.8	35.6	33.3	28.2	20.7	26.5	29.1
CP 79-318	33.0	25.9	+29.4	33.8	32.3	23.3	18.5	32.5	28.6
CP 79-348	30.1	21.8	23.8	27.7	32.3	27.5	26.6	26.5	27.0
CP 70-321	31.4	22.4	24.7	27.2	28.7	28.7	22.9	29.3	26.9
CP 65-357	29.3	20.0	22.1	30.4	27.9	31.1	23.4	25.1	26.2
CP 72-356	31.1	20.6	26.4	26.4	26.5	23.5	20.8	28.1	25.4
CP 79-332	33.4	21.1	23.7	29.7	24.0	26.2	17.3	27.0	25.3
CP 72-370	33.4	20.9	26.4	31.1	29.3	23.2	18.1	21.7	25.3
CP 79-300	34.4	29.2	+29.6	35.7	33.4	--	--	--	--
CP 65-357 KT	31.5	17.5	--	37.8	27.8	--	--	25.8	--
HSD .05	5.2	NS	6.5	NS	NS	NS	NS	NS	3.0

Table 3. Results of plant cane variety tests on light soil at 8 locations during 1984.

Variety	Yield of sugar per ton of cane (pounds)								
	Bon Secour	Cinclare	Georgia	Glenwood	Lanaux	Oaklawn	R. Hebert	St. John	Avg.
CP 79-318	234	249	245	209	264	254	253	246	244
CP 76-331	227	257	238	229	257	239	244	248	242
CP 79-332	229	257	229	217	259	237	252	246	241
CP 70-321	232	251	232	210	248	233	254	256	239
CP 65-357	222	244	234	207	262	229	255	254	238
CP 72-356	212	247	218	223	254	221	251	236	233
CP 72-370	215	239	225	232	246	228	235	244	233
CP 79-348	195	241	236	195	260	228	236	229	228
CP 74-383	-178	241	228	194	-225	222	244	215	-218
CP 79-300	184	233	223	206	243	---	---	---	---
CP 65-357 KT	221	235	---	199	260	---	---	228	---
HSD .05	40	NS	NS	NS	30	NS	NS	NS	12

Table 4. Results of first stubble variety tests on light soil at 8 locations during 1984.

Variety	Yield of sugar per acre (pounds)								
	Bon Secour	Cinclare	Georgia	Glenwood	Lanaux	Oaklawn	R. Hebert	St. John	Avg.
CP 70-321	5103	+7736	+5357	+6655	6234	+6472	+6449	+7347	+6418
CP 72-356	6181	+6464	+4952	+6261	6522	6129	+6140	+6480	+6141
CP 74-383	5374	5950	+4913	+6290	7175	6226	+6713	6409	+6112
CP 76-331	5405	3590	+5936	+6646	+7865	5224	5741	6298	+5780
CP 72-370	5222	4358	+4852	+5709	6822	5923	5813	5796	+5618
CP 65-357	3524	2054	3231	3658	5279	5016	4430	5313	4051
HSD .05	NS	4060	862	1097	2046	1269	1391	1112	701
Date Harvested	10/31	11/26	10/30	11/14	11/15	11/06	11/27	11/07	

Table 5. Results of first stubble variety tests on light soil at 8 locations during 1984.

Variety	Yield of cane per acre (tons)								
	Bon Secour	Cinclare	Georgia	Glenwood	Lanaux	Oaklawn	R. Hebert	St. John	Avg.
CP 74-383	+29.8	25.0	+22.0	+29.0	33.0	+27.7	+26.3	+26.5	+27.4
CP 70-321	+25.5	+30.1	+21.8	+26.9	26.2	+25.5	+25.5	+26.6	+26.0
CP 72-356	+27.4	25.3	+20.6	+26.0	25.2	24.3	+23.0	23.9	+24.5
CP 72-370	+25.6	17.9	+20.1	+22.9	29.5	+24.9	+23.1	24.4	+23.6
CP 76-331	+25.7	14.3	+23.6	+26.6	30.8	20.0	21.5	22.2	+23.2
CP 65-357	17.6	8.6	14.9	15.4	24.7	20.3	17.7	21.1	17.5
HSD .05	5.6	17.0	3.4	3.8	NS	4.5	4.7	4.1	4.0

Table 6. Results of first stubble variety tests on light soil at 8 locations during 1984.

Variety	Yield of sugar per ton of cane (pounds)								
	Bon Secour	Cinclare	Georgia	Glenwood	Lanaux	Oaklawn	R. Hebert	St. John	Avg.
CP 72-356	+227	258	241	241	+259	252	267	271	+252
CP 76-331	210	253	+252	250	+255	262	267	262	+251
CP 70-321	201	257	+246	248	+238	254	253	+276	+246
CP 72-370	203	248	242	249	231	238	252	258	240
CP 65-357	200	244	217	239	213	247	251	253	232
CP 74-383	181	240	224	217	218	-225	255	242	224
HSD .05	25	NS	28	NS	20	18	NS	22	8

Table 7. Results of second stubble variety tests on light soil at 6 locations during 1984.

Variety	Yield of sugar per acre (pounds)						
	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Avg.
CP 74-383	4502	+5729	4527	+6083	+6368	+6109	+5545
CP 72-356	+6321	4131	4244	+5381	+5836	+6384	+5437
CP 76-331	4630	+5640	3470	+6072	5697	5104	+5079
CP 70-321	5173	3365	- 632	4607	5331	+6038	+4227
CP 72-370	4620	2173	-2733	4162	4728	4495	3890
CP 65-357	3929	3278	1531	3648	4479	3466	3393
CP 70-330	2114	1478	-1551	3979	3224	2636	-2541
HSD .05	1824	2281	1480	1318	1250	1862	659
Date Harvested	10/31	10/30	11/14	11/15	11/30	11/07	

Table 8. Results of second stubble variety tests on light soil at 6 locations during 1984.

Variety	Yield of cane per acre (tons)						
	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Avg.
CP 74-383	28.2	+27.2	+22.3	+26.3	+25.5	+26.1	+25.9
CP 72-356	+30.4	17.7	+17.7	21.0	22.7	+24.3	+22.5
CP 76-331	24.1	+23.6	+16.0	+25.6	22.4	21.7	+22.2
CP 70-321	25.1	15.0	2.8	20.2	21.1	22.9	17.9
CP 72-370	21.8	9.8	11.7	18.1	19.4	19.7	17.0
CP 65-357	21.1	15.2	6.5	16.7	17.9	15.2	15.4
CP 70-330	-11.5	- 6.8	6.7	16.1	-12.9	11.1	-11.0
HSD .05	8.5	7.9	6.4	5.6	4.9	6.7	2.7

Table 9. Results of second stubble variety tests on light soil at 6 locations during 1984.

Variety	Yield of sugar per acre (pounds)						
	Bon Secour	Georgia	Glenwood	Lanaux	R. Hebert	St. John	Avg.
CP 72-356	208	233	242	+257	257	+263	+244
CP 70-321	206	220	222	229	254	+264	233
CP 76-331	192	239	216	237	255	236	229
CP 72-370	211	218	235	231	243	229	228
CP 70-330	187	215	228	248	252	229	227
CP 65-357	186	213	238	218	251	226	222
CP 74-383	160	210	203	232	250	234	215
HSD .05	NS	NS	NS	32	NS	31	12

Table 10. Results of plant cane variety tests on heavy soils at 3 locations during 1984.

Variety	Yield of sugar per acre (pounds)			
	Evan Hall	Ardoyne	Mcleod	Avg.
CP 76-331	5582	5742	7878	6730
CP 79-348	6226	5485	7217	6721
CP 79-318	5895	5382	7491	6693
CP 74-383	5802	5719	7413	6607
CP 79-332	4999	5669	7934	6466
CP 70-321	5598	5255	7186	6392
CP 72-356	5795	6030	6607	6201
CP 65-357	5152	5875	6756	5953
CP 72-370	5080	6420	6778	5929
CP 79-300	4907	--	8594	--
CP 65-357 KT	6083	--	--	--
CP 65-357 KT-SG	5957	--	--	--
HSD .05	NS	NS	NS	NS
Date harvested	11/05	10/26	12/03	

Table 11. Results of plant cane variety tests on heavy soils at 3 locations during 1984.

Variety	Yield of cane per acre (tons)			
	Evan Hall	Ardoyne	Mcleod	Avg.
CP 74-383	26.3	29.6	30.5	28.4
CP 79-348	27.0	29.7	28.5	27.8
CP 79-318	24.3	26.0	29.6	27.0
CP 76-331	23.5	27.5	29.9	26.7
CP 72-356	25.5	29.8	27.5	26.5
CP 70-321	23.0	25.5	28.4	25.7
CP 79-332	20.0	29.5	30.1	25.1
CP 65-357	23.6	29.3	25.9	24.7
CP 72-370	22.0	27.9	27.4	24.7
CP 79-300	23.3	--	35.4	--
CP 65-357 KT	27.0	--	--	--
CP 65-357 KT-SG	27.2	--	--	--
HSD .05	NS	NS	NS	NS

Table 12. Results of plant cane variety tests on heavy soils at 3 locations during 1984.

Variety	Yield of sugar per ton of cane (pounds)			
	Evan Hall	Ardoyne	Mcleod	Avg.
CP 79-332	249	193	263	256
CP 76-331	238	209	263	251
CP 70-321	243	206	252	248
CP 79-318	242	207	253	247
CP 79-348	231	185	253	242
CP 65-357	219	200	261	240
CP 72-370	230	230	247	239
CP 72-356	227	202	241	234
CP 74-383	220	193	243	232
CP 79-300	208	---	243	---
CP 65-357 KT	227	---	---	---
CP 65-357 KT-SG	216	---	---	---
HSD .05	NS	NS	NS	NS

Table 13. Results of first stubble variety tests on heavy soil at 3 locations during 1984.

Variety	Yield of sugar per acre (pounds)			
	Allain	Evan Hall	Mcleod	Avg.
CP 74-383	+5605	5533	6282	+5832
CP 70-321	+5590	6197	5748	+5813
CP 72-370	+4720	5021	6253	5360
CP 72-356	+5033	5857	4865	5196
CP 76-331	+5110	4471	5404	5043
CP 65-357	3075	5291	5498	4560
HSD .05	1359	NS	NS	909
Date Harvested	11/08	11/05	11/01	

Table 14. Results of first stubble variety tests on heavy soil at 3 locations during 1984.

Variety	Yield of cane per acre (tons)			
	Allain	Evan Hall	Mcleod	Avg.
CP 74-383	+25.3	27.8	28.0	+27.0
CP 70-321	+22.9	26.0	24.0	+24.1
CP 72-370	+20.5	22.1	25.7	22.8
CP 72-356	+22.2	24.6	21.7	22.6
CP 76-331	+21.3	20.5	23.2	21.8
CP 65-357	13.7	24.2	23.4	20.1
HSD .05	4.9	NS	NS	3.3

Table 15. Results of first stubble variety tests on heavy soil at 3 locations during 1984.

Variety	Yield of sugar per ton of cane (pounds)			
	Allain	Evan Hall	Mcleod	Avg.
CP 70-321	245	239	240	241
CP 72-370	230	227	243	234
CP 76-331	240	219	231	231
CP 72-356	227	238	224	229
CP 65-357	225	219	234	227
CP 74-383	221	200	225	217
HSD .05	NS	NS	NS	NS

Table 16. Results of second stubble variety tests on heavy soil at 2 locations during 1984.

Variety	Yield of sugar per acre (pounds) Allain	Mcleod	Avg.
CP 74-383	+5685	6154	+5886
CP 72-356	+5502	5921	+5682
CP 72-370	4301	+6926	+5426
CP 76-331	4790	5779	5214
CP 70-321	3531	6052	4611
CP 65-357	3774	5209	4389
CP 70-330	3191	5742	4284
HSD .05	1314	1392	882
Date Harvested	11/08	11/01	

Table 17. Result of second stubble variety tests on heavy soil at 2 locations.

Variety	Yield of cane per acre (tons) Allain	Mcleod	Avg.
CP 74-383	+24.8	23.6	+24.3
CP 72-356	+23.6	22.7	+23.2
CP 72-370	18.3	24.6	21.0
CP 76-331	20.2	20.9	20.5
CP 70-321	15.4	21.1	17.9
CP 65-357	15.1	21.0	17.6
CP 70-330	13.7	21.6	17.1
HSD .05	5.2	NS	3.4

Table 18. Results of second stubble variety tests on heavy soil at 2 locations.

Variety	Yield of sugar per ton (pounds) Allain	Mcleod	Avg.
CP 72-370	234	+282	255
CP 76-331	237	+276	254
CP 70-321	229	+287	254
CP 65-357	251	248	250
CP 70-330	234	266	248
CP 72-356	233	261	245
CP 74-383	230	261	243
HSD .05	NS	21	NS

Table 19. Plant cane variety stalk weights and populations as an average of all locations during 1984.

Variety	Stalk wts.	Variety	Population
CP 72-356	+2.55	CP 74-383	+25380
CP 79-348	+2.54	CP 79-318	23299
CP 76-331	2.51	CP 76-331	22670
CP 70-321	2.46	CP 65-357	22036
CP 79-318	2.42	CP 79-348	21912
CP 65-357	2.39	CP 79-332	21781
CP 74-383	2.38	CP 70-321	21723
CP 72-370	2.36	CP 72-370	21604
CP 79-332	2.35	CP 72-356	20442
HSD .05	.14		2792

Table 20. First stubble variety stalk weights and populations as an average of all locations during 1984.

Variety	Stalk wts.	Variety	Population
CP 76-331	2.13	CP 74-383	+28108
CP 72-356	2.07	CP 70-321	+25256
CP 70-321	2.04	CP 72-370	+23814
CP 65-357	1.98	CP 72-356	+23371
CP 72-370	1.97	CP 76-331	+21575
CP 74-383	1.95	CP 65-357	18369
HSD .05	NS		2643

Table 21. Second stubble variety stalk weights and populations as an average of all locations during 1984.

Variety	Stalk wts.	Variety	Population
CP 70-330	+2.18	CP 74-383	+28990
CP 76-331	+1.95	CP 72-356	+24787
CP 70-321	1.90	CP 76-331	+22483
CP 72-356	1.83	CP 72-370	20507
CP 74-383	1.77	CP 70-321	18554
CP 65-357	1.76	CP 65-357	17995
CP 72-370	1.74	CP 70-330	-11570
HSD .05	.15		4028

Sweet Sorghum for Biomass and Sugar Production in Louisiana

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Experiments were conducted in 1984 to determine the potential of growing sweet sorghum as a biomass and sugar fermentation feedstock for the production of fuel alcohol. One experiment was continued on the St. Gabriel Research Station to test seven varieties and two dates of planting sweet sorghum on a Commerce silt loam soil. Another experiment was initiated on the Dean Lee Research Station to test six varieties on a Norwood silt loam soil and Moreland clay soil.

St. Gabriel Test - Varieties x Dates of Planting:

The varieties planted in this test were Wray, Keller, Theis, M81E, Mer. 76-6, Mer. 71-1 and NK 405. The NK 405 cultivar is a hybrid from a cross between sweet sorghum and grain sorghum provided by Northrup King Seed Company. The dates of planting tested with each variety were April 18 and May 28, 1984. The sorghum plots were planted in two drills, 22 inches apart on rows six feet wide. The plant spacing was three plants per foot in each drill. The plots were three rows wide and 50 feet long with three replications of each treatment. The method of planting was chosen to accommodate sugarcane harvesting equipment.

A 13-13-13 fertilizer at the rate of 500 pounds per acre was bedded in the rows prior to planting. Ammonium nitrate at the rate of 500 pounds per acre was applied as a top-dress application when the plants were about 10 inches tall. Milogard was used as a preemergence herbicide and Guthion was used to control sugarcane borers. Furadan was applied at planting time to control lesser corn borers.

The yield components and yield of stalks, leaves and tops were measured at the mature stage of each variety. The percent brix or total sugar solids and sucrose in the sorghum juice and percent fiber in the stalks were measured at harvest time of each variety. The brix and sucrose were determined with a refractometer and polariscope, respectively. The total fermentable sugars were calculated from a predetermined relationship between liquid chromatograph analyses for total sugars and brix analyses expressed by the equation % total sugars = % Brix - .70. The alcohol yield was calculated from the theoretical conversion of .07 gallon of alcohol per pound of fermentable sugar.

Yield component:

The data obtained on stalk population and weight per stalk for each variety and planting date and for the factorial means of each component are reported in Table 1. The plant population on each plot was adjusted by hand thinning to a stand of approximately 40,000 plants per acre. The differences in population at harvest time were due to the differences among varieties in tillering characteristics and mortality rate of the plants. Apparently the Wray variety had a relatively high plant mortality rate as compared to the other varieties. As an average of planting dates, the average stalk weight ranged from 0.99 pound with Keller to 1.50 pounds with NK405. The effects of planting dates on stalk population and weight were not significant.

Biomass yield:

The biomass yield data obtained in the St. Gabriel test are reported for each variety and plant date in Table 2 and for the factorial means in Table 3. As an average of planting dates, the fiber content in the stalks which indicates the percent juice extraction ranged from 11.3% in Wray to 18.0% in NK405 and 18.9% in Theis. The net stalk yield ranged from 16.3 T/A with Wray to 29.1 T/A with NK405. The percent leaves on the stalks ranged from 11.3% with Theis and NK405 to 17.6% with Mer. 76-6. The percent tops which included the seed heads, ranged from 3.4% with Wray to 10.8% with Mer. 76-6. The total biomass yield, which included the stalks, leaves and tops ranged from 19.4 T/A with Wray to 38.2 T/A with Mer. 76-6. The total biomass of Mer. 76-6 consisted of a lower percent stalks and a higher percent leaves and tops than with the other varieties. As an average of varieties, the effects of planting dates on each biomass component were small.

Sugar and alcohol yield:

The sugar and alcohol yield data are reported for each variety and planting date and for factorial means in Table 4. The brix sucrose and total sugars in the sorghum juice are expressed as percent of stalk weight and not of extracted juice. As an average of planting dates, the percent brix ranged from 13.0% in NK405 to 19.7% in Keller. The percent sucrose ranged from 6.9% in NK405 to 16.2% in Keller. The alcohol yield, calculated from the brix and total fermentable sugar content, ranged from 406 gal./A with Wray to 540 gal./A with Mer. 76-6. The slightly lower sugar yields produced from the May planting as compared to the April planting were not significant.

Dean Lee Test - Varieties x Soil Types:

The varieties planted in the Dean Lee test were Wray, Keller, Theis, M81E, Mer. 76-6 and NK405. The soil types were a light-textured Norwood silt loam and a heavy-textured Moreland clay soil. The plots were planted on April 25, 1984 in single drills on rows 40 inches wide. Plant spacing was three plants per foot of row. The plots were four rows wide and 48 feet long with four replications of each variety on each soil type. The cultural practices and experimental procedures used in this test were similar to ones described for the St. Gabriel test.

Yield component:

The data obtained in this test on stalk population and weight per stalk for each variety and soil type are reported in Table 5. A highly significant interaction occurred between soil types and varieties in plant population and therefore, only the means for stalk weight are shown in the Table. The population on each plot was adjusted by hand thinning to three plants per foot of row. The stalk population per acre at harvest time ranged from 30,100 with Theis to 37,800 with Keller on the Norwood soil and from 33,200 with Wray to 45,500 with Mer. 76-6 on Moreland soil. The higher population of some varieties on Moreland than Norwood soil was apparently due to the greater tillering ability of some varieties on a clay soil.

As an average of varieties, the weight per stalk was 1.60 pounds on Norwood soil and 1.75 pounds on Moreland soil. As an average of soil types,

the weight per stalk ranged from 0.99 pounds with Keller to 2.12 pounds with Theis.

Biomass yield:

The biomass yield data obtained in the Dean Lee test are shown for each variety and soil type in Table 6 and for the factorial means in Table 7. As an average of varieties, the fiber, stalk and leaf yields per acre were higher whereas the percent stalk fiber was lower on the Moreland than the Norwood soil. As an average of soil types, the fiber content ranged from 10.1% in Wray to 19.7% in NK405. The net stalk yield ranged from 18.0 T/A with Wray to 39.8 T/A with Mer. 76-6. The percent tops, which included the seed heads, ranged from 4.1% with Keller to 9.8% with NK405. The total biomass yield, which included the stalks, leaves and tops ranged from 21.4 T/A with Wray to 51.0 T/A with Mer. 76-6.

Sugar and alcohol yield:

The sugar and alcohol yield data obtained in this test are reported for each variety and soil type and for factorial means in Table 8. The brix, sucrose and total sugar content in the juice are expressed as percent of stalk weight. A highly significant interaction occurred between soil types and varieties in percent sucrose. The sucrose content in the stalks ranged from 7.2% in Theis to 16.0% in Keller on Norwood soil and from 6.3% in Theis to 16.0% in Keller on Moreland soil. As an average of varieties, the percent brix and percent fermentable sugars were lower but the sugar and alcohol yields per acre were higher on the Moreland clay soil than the Norwood silt loam soil. This was due to the higher stalk yield on the clay soil.

As an average of soil types, the brix ranged from 13.6% in NK405 to 19.5% in Keller. The alcohol yield calculated from percent brix and fermentable sugars ranged from 462 gal./A with Wray to 810 gal./A with Theis.

Table 1. Effect of varieties and dates of planting on the yield components of sweet sorghum, St. Gabriel Station, 1984.

Variety of sorghum	Date of planting	Average stalk Population 1000/A	Average stalk Weight lbs.
Wray	April 18	26.4	1.18
	May 28	25.5	1.24
Keller	April 18	40.3	0.94
	May 28	39.2	1.04
Theis	April 18	33.8	1.42
	May 28	35.0	1.39
M81E	April 18	41.0	1.32
	May 28	40.2	1.29
Mer. 76-6	April 18	38.3	1.50
	May 28	37.4	1.46
Mer. 71-1	April 18	33.6	1.32
	May 28	32.7	1.31
NK405	April 18	40.4	1.48
	May 28	41.9	1.53
HSD 5%		5.0	0.23
		Mean treatment effect	
Wray		26.0	1.21
Keller		39.8	0.99
Theis		34.4	1.41
M81E		40.5	1.31
Mer. 76-6		37.8	1.48
Mer. 71-1		33.2	1.32
NK405		41.1	1.50
	April 18	36.3	1.31
	May 28	36.0	1.32
HSD varieties 5%		3.1	0.14
HSD dates 5%		NS	NS

Table 4. Effect of varieties and date of planting on the sugar and alcohol yield of sweet sorghum, St. Gabriel Station, 1984.

Variety of sorghum	Date of planting	Sugar yield in stalks at maturity					Alcohol yield
		Brix	Sucrose		Total sugars		
		%	%	lbs./A	%	lbs./A	gal./A
Wray	April 18	18.7	15.9	5346	18.0	6031	422
	May 28	18.3	15.3	4849	17.6	5577	390
Keller	April 18	19.8	16.3	5890	19.1	6901	483
	May 26	19.6	16.0	6149	18.9	7248	507
Theis	April 18	15.3	8.3	3736	14.6	6614	463
	May 28	14.9	8.1	3733	14.2	6531	457
M81E	April 18	14.9	9.9	5386	14.2	7700	539
	May 28	14.6	9.8	4828	13.9	6881	482
Mer. 76-6	April 18	15.1	9.8	5347	14.4	7866	551
	May 28	14.6	9.4	5088	13.9	7555	529
Mer. 71-1	April 18	17.4	11.8	5224	16.7	7407	518
	May 28	17.0	11.5	4709	16.3	6673	467
NK405	April 18	13.1	7.0	3975	12.4	7047	493
	May 28	12.9	6.9	4082	12.2	7234	506
HSD 5%		1.8	1.8	1112	1.8	1240	87
			Mean treatment effect				
Wray		18.5	15.6	5098	17.8	5804	406
Keller		19.7	16.2	6019	19.0	7074	495
Theis		15.1	8.2	3735	14.4	6580	460
M81E		14.8	9.9	5107	14.1	7291	510
Mer. 76-6		14.8	9.6	5218	14.1	7710	540
Mer. 71-1		17.2	11.7	4966	16.5	7040	493
NK405		13.0	6.9	4029	12.3	7141	500
	April 18	16.3	11.3	4986	15.6	7083	496
	May 26	16.0	11.0	4777	15.3	6814	477
HSD varieties 5%		1.1	1.1	679	1.1	758	53
HSD dates 5%		NS	NS	NS	NS	NS	NS

Brix, sucrose and sugars are expressed as percent of stalk weight.

Table 5. Effect of soil types and varieties on the yield components of sweet sorghum, Dean Lee Research Station, 1984.

Type of soil	Variety of sorghum	Average stalk Population 1000/A	Average stalk Weight lbs.
Norwood sil	Wray	33.8	0.87
	Keller	37.8	0.84
	Theis	30.1	2.16
	M81E	34.9	1.91
	Mer. 76-6	36.0	1.89
	NK405	36.5	1.94
Moreland clay	Wray	33.2	1.29
	Keller	44.4	1.15
	Theis	45.4	2.08
	M81E	44.6	1.98
	Mer. 76-6	45.5	2.01
	NK405	36.9	2.01
HSD 5%		6.4	0.41
		Mean treatment effect	
Norwood sil		*	1.60
Moreland c		*	1.75
	Wray	*	1.08
	Keller	*	0.99
	Theis	*	2.12
	M81E	*	1.95
	Mer. 76-6	*	1.95
	NK405	*	1.98
HSD soil 5%			0.10
HSD varieties 5%			0.25

*Significant soil x variety interaction.

Table 8. Effect of soil types and varieties on the sugar and alcohol yield of sweet sorghum, Dean Lee Research Station, 1984.

Type of soil	Variety of sorghum	Sugar yield in stalks at maturity					Alcohol yield
		Brix	Sucrose		Total sugars		
		%	%	lbs./A	%	lbs./A	gal./A
Norwood sil	Wray	19.3	15.7	4588	18.6	5442	381
	Keller	19.9	16.0	5045	19.2	6045	423
	Theis	15.8	7.2	4720	15.1	9792	686
	M81E	15.9	9.6	6409	15.2	10131	709
	Mer. 76-6	15.9	11.2	7671	15.2	10345	724
	NK405	13.9	9.9	6967	13.2	9338	654
Moreland c	Wray	18.9	15.7	6687	18.2	7755	543
	Keller	19.2	16.0	8184	18.5	9459	662
	Theis	15.0	6.3	5973	14.3	13360	935
	M81E	14.7	7.8	6812	14.0	12287	860
	Mer. 76-6	14.7	8.9	8060	14.0	12758	893
	NK405	13.3	9.5	7023	12.6	9345	654
HSD 5%		1.5	1.8	2179	1.5	2360	165
		Mean treatment effect					
Norwood sil		16.8	*	5900	16.1	8515	596
Moreland c		16.0	*	7123	15.3	10826	758
	Wray	19.1	*	5637	18.4	6597	462
	Keller	19.5	*	6615	18.8	7752	543
	Theis	15.4	*	5346	14.7	11576	810
	M81E	15.3	*	6611	14.6	11207	785
	Mer. 76-6	15.3	*	7865	14.6	11551	809
	NK405	13.6	*	6995	12.9	9341	654
HSD soils 5%		0.4		517	0.4	560	39
HSD varieties 5%		0.9		1330	0.9	1440	101

*Significant soil x variety interaction.
Brix, sucrose and sugars are expressed as percent of stalk weight.

Table 2. Effect of varieties and dates of planting on the biomass yield of sweet sorghum at maturity, St. Gabriel Research Station, 1984.

Variety of sorghum	Date of planting	Stalk fiber		Stalk yield		Leaves yield		Tops yield		Total
		%	T/A	%	T/A	%	T/A	%	T/A	T/A
Wray	April 18	11.2	1.9	82.7	16.7	13.1	2.6	4.2	0.8	20.2
	May 28	11.4	1.8	85.5	15.8	12.0	2.2	2.5	0.5	18.5
Keller	April 18	12.6	2.3	83.0	18.1	12.6	2.8	4.4	0.9	21.8
	May 28	15.3	3.0	82.1	19.2	14.7	3.5	3.1	0.7	23.4
Theis	April 18	18.6	4.2	79.8	22.6	11.7	3.3	8.5	2.4	28.3
	May 28	19.3	4.4	82.5	22.9	11.0	3.1	6.5	1.8	27.8
M81E	April 18	13.0	3.5	77.1	27.1	16.4	5.8	6.5	2.3	35.1
	May 28	12.4	3.1	79.2	24.8	15.4	4.8	5.4	1.7	31.3
Mer. 76-6	April 18	14.2	3.9	71.4	27.4	17.2	6.6	11.7	4.4	38.3
	May 28	14.2	3.9	71.9	27.3	18.0	6.8	10.2	3.9	38.0
Mer. 71-1	April 18	13.0	2.9	78.5	22.1	17.1	4.8	4.4	1.3	28.2
	May 28	13.6	2.8	79.1	20.4	16.8	4.4	4.1	1.0	25.8
NK405	April 18	18.2	5.2	79.8	28.5	11.6	4.1	8.6	3.1	35.7
	May 28	17.7	5.3	80.4	29.7	11.0	4.1	8.6	3.2	37.0
HSD 5%		2.4	0.8	6.6	3.2	4.1	1.5	4.8	1.7	4.1

Table 3. Mean effect of varieties and dates of planting on the biomass yield of sweet sorghum.

Variety of sorghum	Date of planting	Stalk fiber		Stalk yield		Leaves yield		Tops yield		Total
		%	T/A	%	T/A	%	T/A	%	T/A	T/A
Wray		11.3	1.8	84.1	16.3	12.5	2.4	3.4	0.7	19.4
Keller		14.0	2.6	82.6	18.7	13.7	3.1	3.8	0.8	22.6
Theis		18.9	4.3	81.2	22.8	11.3	3.2	7.5	2.1	28.1
M81E		12.7	3.3	78.1	25.9	15.9	5.3	6.0	2.0	33.2
Mer. 76-6		14.2	3.9	71.7	27.4	17.6	6.7	10.8	4.1	38.2
Mer. 71-1		13.3	2.8	78.8	21.3	17.0	4.6	4.3	1.2	27.0
NK405		18.0	5.2	80.1	29.1	11.3	4.1	6.6	3.2	36.4
	April 18	14.4	3.4	78.9	23.2	14.3	4.3	6.9	2.2	29.7
	May 28	14.8	3.5	80.1	22.9	14.1	4.1	5.8	1.8	28.9
HSD varieties 5%			0.5	4.0	2.0	2.5	0.9	2.9	1.0	2.5
HSD dates 5%		NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 6. Effect of soil types and varieties on the biomass yield of sweet sorghum at maturity, Dean Lee Research Station, 1984.

Type of soil	Variety of sorghum	Stalk fiber		Stalk yield		Leaves yield		Tops yield		Total
		%	T/A	%	T/A	%	T/A	%	T/A	T/A
Norwood sil	Wray	11.9	1.7	83.3	14.6	11.7	2.1	5.0	0.9	17.6
	Keller	12.5	2.0	84.8	15.8	10.6	2.0	4.6	0.9	18.7
	Theis	17.9	5.8	85.7	32.4	9.1	3.5	5.2	2.0	37.9
	M81E	15.1	5.0	81.8	33.3	11.9	4.8	6.3	2.6	40.7
	Mer. 76-6	14.6	5.0	76.2	34.1	14.7	6.6	9.1	4.1	44.7
	NK405	21.1	7.5	71.9	35.4	16.9	8.4	11.2	5.5	49.2
Moreland c	Wray	8.3	1.8	84.7	21.4	11.6	2.9	3.7	0.9	25.3
	Keller	10.8	2.7	84.7	25.6	11.8	3.5	3.5	1.1	30.2
	Theis	16.7	7.9	87.3	46.9	8.4	4.5	4.3	2.3	53.7
	M81E	13.5	6.0	84.7	44.0	10.3	5.4	5.0	2.6	51.9
	Mer. 76-6	14.6	6.7	79.6	45.6	12.9	7.4	7.6	4.4	57.4
	NK405	18.3	7.0	76.1	37.2	15.6	7.6	8.4	4.1	48.9
HSD 5%		4.4	2.5	2.6	8.1	3.0	2.0	2.5	1.4	10.2

Table 7. Mean effect of soil types and varieties on the biomass yield of sweet sorghum.

Type of soil	Variety of sorghum	Stalk fiber		Stalk yield		Leaves yield		Tops yield		Total
		%	T/A	%	T/A	%	T/A	%	T/A	T/A
Norwood sil		15.5	4.5	80.6	27.6	12.5	4.6	6.9	2.6	34.8
Moreland c		13.7	5.3	82.8	36.8	11.8	5.2	5.4	2.6	44.5
	Wray	10.1	1.8	84.0	18.0	11.7	2.5	4.4	0.9	21.4
	Keller	11.7	2.4	84.8	20.7	11.2	2.8	4.1	1.0	24.4
	Theis	17.3	6.8	86.5	39.6	8.7	4.0	4.8	2.2	45.8
	M81E	14.3	5.5	83.3	38.7	11.1	5.1	5.7	2.6	46.3
	Mer. 76-6	14.6	5.9	77.9	39.8	13.4	7.0	8.3	4.2	51.0
	NK405	19.7	7.2	74.0	36.3	16.3	8.0	9.8	4.8	49.0
HSD soils 5%		1.1	0.6	0.6	1.9	NS	0.5	0.6	NS	2.4
HSD varieties 5%		2.7	1.6	1.6	5.0	1.8	1.2	1.6	0.9	6.3